SCIENCE AND TECHNOLOGY STATEMENT 1985–86

by
The Minister for Science
The Honourable Barry O. Jones

NOVEMBER 1985

DEPARTMENT OF SCIENCE

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SCIENCE AND TECHNOLOGY STATEMENT

1985-86

The Minister for Science

The Honourable Barry O. Jones, M.P.

A statement on the Commonwealth Government sector

prepared by the Department of Science

on the basis of information provided by

agencies of the Commonwealth Government

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PREFACE

BY THE MINISTER FOR SCIENCE

THE HON. BARRY O. JONES, M.P.

The Science and Technology Statement is concerned primarily with the in-house R&D activities of Government, but there is also a good deal of information about Government financial measures supporting S&T activities external to Government. As I have said on other occasions, however, the problem in Australia is not so much with Government funding of R&D, but with private sector funding. Industry spends too little on R&D, not Government too much.

This Government has taken many measures aimed at stimulating a more outward-looking, export-oriented philosophy by Australian firms - one based on innovative products, innovative production methods and excellence in quality. We have achieved in this country excellence in many areas of science. We desperately need that excellence to be harnessed by technologically-oriented entrepreneurs.

Relevant measures taken by the Government since it came to office have included:

- the introduction of legislation to promote the development of a private sector venture capital market to encourage Australian businesses which utilise innovative technology, have the potential for rapid growth, are skill intensive, export oriented, internationally competitive and significant generators of employment,
- the establishment of a 150% taxation deduction scheme for industrial R&D,
- significantly improved funding for the Australian Industrial R&D Incentives Scheme,
- the introduction of the National Research Fellowships scheme to promote more effective research interactions between industry and the academic world, and
- important steps towards development of a National Technology Strategy which will serve as a guide towards policy development across a wide field and enhance the continuing community debate about Australia's industrial future so that the opportunities and challenges are more thoroughly understood by all affected interests.

The full practical effect of these measures will not be felt for some time. I am, however, encouraged by recent trends towards a better coverage and awareness of R&D and issues concerning innovation and new technology in the business and financial press of this country. The importance of science and technology to our future prospects as a nation certainly needs to become more firmly embedded in the Australian consciousness.

We have always regarded the achievements of our sportsmen with pride and sporting events of various kinds are a prime focus of national attention. Over recent years, I am pleased to say, artistic and cultural pursuits - once looked at askance by most of the population - have come into much better national regard.

I look forward to the day when the value of science and technology will also be better recognised: the intrinsic cultural value of science as well as the potential benefits of technology; the contribution each can make to national growth; and their wide recognition as a source of achievement, national pride and international recognition for Australians.

May I dare to hope, now that we are adopting this form of terminology for broad purposes, that science should join sport and the arts to form an additional kind of trilogy in our national awareness!

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DEVELOPMENT OF THE STATEMENT

This is the seventh annual Statement providing detailed information about expenditure by the Commonwealth Government in support of science and technology (S&T).

It should be emphasised that the Science and Technology Statement is only one among a number of sources of information on Commonwealth Government involvement in scientific and technological matters. The Department of Science is continuing to develop other elements of a larger package of source material for policy makers, policy analysts and advisers, and others concerned with science and technology.

There is a consistent effort to maintain compatibility with international practice, particularly in relation to the terminology and definitions adopted by OECD and UNESCO. One persistent point of confusion to some has been the common usage of "science and technology" as being synonymous with the natural sciences and engineering (NSE), whereas in international usage it extends to the social sciences and humanities (SSH). This was one of the factors which led to the separate presentation of NSE and SSH in the tables of the Statement. The SSH figures and their relationship to the NSE figures are becoming more significant as the economic and social importance of information technology and of the use of information increases.

This Statement goes to Press only some six months after the previous one. Some sections, notably those of Chapter IV (International Comparisons and Trends), have therefore been only slightly revised as little new data are to hand.

Earlier publication of the Statement has been achieved through a number of procedural changes, including the cooperation of a number of major agencies in the early provision of information. It has also been necessary to adopt a slightly higher level of estimation by the Department of Science where agencies (indicated in Appendix A) were unable to meet these early deadlines.

ACCURACY AND ROUNDING CONVENTION

With few exceptions, clearly indicated in the relevant tables, all numerical data represent actual expenditures in millions of Australian dollars. Entries have been rounded to the next $million, $0.1m, or $0.01m, according to the level of aggregation of the tables. In the Ministry tables (Appendix A), most entries are rounded to the next $0.001m. It should be recognised, however, that the data are often less accurate than implied. This is because - although most large items are checked against the relevant Budget appropriations or other financial statements - the disaggregation and itemisation required by the Statement entails some estimation by the responding agencies. Some discrepancies between quoted totals and actual sums of components listed in tables are due to rounding.

CHAPTER I

BROAD DEVELOPMENTS OF THE PAST YEAR

I.1 General

A number of recent developments of broad implication are outlined below. Developments of a more specific nature are detailed in the Chapter R&D Trends and Developments by Socio-economic Objective.

Commonwealth measures in the Science and Technology area show an increasing stress on the high technology/high employment sectors of the economy, mostly related to manufacturing industry. National (Project SCORE) and international (OECD) indicators show that Australian manufacturing industry lags behind its trade partners in terms of resources devoted to R&D.

The corrective action initiated by the Government consists of programs of special benefit to manufacturing industry, both directly to encourage research and to promote self-help by manufacturing industry.

I.2 National Technology Strategy

A revised discussion draft for the National Technology Strategy was released in May 1985. The purpose of the revision is to:

- improve understanding of relevant issues and their interdependence
- provide a framework for policy development
- ensure technological objectives are co-ordinated, coherent and can be readily acted on
- establish a basis for consultation and negotiation between industry, unions, governments and the educational and research communities on Australia's needs for technological development

Four S&T oriented objectives are adopted:

- strengthen Australia's scientific and technological capability;

- improve the utilisation of technology in new and existing industries, and promote the development of new technologies;

- ensure the implementation of effective mechanisms for the equitable sharing of the costs andd benefits of technological change; and

- integrate S&T policy with other policies and ensure effective national and international co-operation between all government organisations with S&T-related responsibilities.

The new draft has been referred to the Government's Task Force on Longer-Term Economic Growth to serve as a guide for policy development across a wide field. It is seen as a valuable reference source as it represents the outcome of lengthy and extensive consultations with a number of interest groups in the technology field, including business, trade unions, Government agencies, researchers and the general community. The Minister for Science is to pursue the issues raised in the Strategy document in tripartite talks with representatives of unions, industry and Government. A continuing community debate of this kind is aimed at achieving a more thorough understanding of the opportunities and challenges by all affected interests.

I.3 Tax Deduction Scheme for Industrial R&D

A 150% company tax deduction for eligible industrial R&D expenditure came into effect from 1 July 1985. The aim is not only to lift Australia's level of R&D but also to promote a more practical and commercial orientation of R&D.

Strict eligibility requirements provide that:

- benefits are restricted to companies - not individuals, partnerships or trusts;
- companies wishing to claim the concession are required to register in advance and provide information on past and present research and development activities, staffing, facilities and sources of funds;
- R&D work must be carried out in Australia;
- the full concession will only apply when spending in a particular year is $50 000 or more, except when claims for smaller amounts are contracted to an approved research institute (as defined by Section 73A(6) of the Income Tax Assessment Act);
- the concession will not apply to activities otherwise directly assisted by the Government.

Work to be subsidised by the concession may be contracted out to institutions like the CSIRO and universities, which already handle the bulk of Australian R&D. This should give more commercial emphasis to the work of these institutions.

Companies which do not have a current taxation liability will continue to receive support through the Australian Industrial Research and Development Incentives Scheme.

I.4 Future Role of AIRDIS in the Promotion of Australian Industrial R&D

A summary report on the promotion of indigenous IR&D in Australia and the effectiveness of the grants elements of the Australian Industrial Research and Development Incentives Scheme (AIRDIS) has been released. The report by Price Waterhouse in Canberra was commissioned by the Government as part of a review of AIRDIS.

A review of AIRDIS is being undertaken for the following reasons:

- the underlying legislation contains clauses which prevent the payment of Project and Commencement Grants for R&D initiated after 30 June 1986;
- the introduction of a 150% taxation allowance scheme as the principal incentive for private sector industrial research development (see I.3 above); and
- the need to assess the effectiveness of AIRDIS in achieving its stated aims and objectives.

Price Waterhouse concluded that the promotion of an increased level of indigenous R&D by firms is an effective method of contributing to the achievement of Government industry policies designed to increase economic growth and development. The study also concluded that AIRDIS plays a useful role in encouraging industrial R&D in Australia.

Two other reports relevant to the review of AIRDIS have recently been completed:

a review, by the Bureau of Industry Economics, of the effectiveness of public interest projects funded under Section 39 of the Industrial Research and Development Incentive Act; and

a report by the Australian Industrial Research and Development Incentives Board 'Future Government Support for Innovation: The Role and Relevance of Industrial R&D Incentives'.

CHAPTER II

RECENT TRENDS IN COMMONWEALTH FUNDED S&T

II.1 Summary

Table 1 and Figure 1 present broad summaries of the information presented in this section, with references to tables presenting further dissections. The Table refers to the total of the Budget sector (net expenditure) and the Non-Budget sector and thus represents Commonwealth "own funds". Budget sector figures are net of recoveries and comprise expenditures from appropriations specifically identified for R&D, estimated expenditures on R&D from other appropriations, and, in the case of Research Trust Funds, the R&D expenditures from the Trust funds which can be attributed on a pro-rata basis to an appropriation. Commonwealth Non-Budget sector figures represent the R&D funded by Commonwealth bodies from their own funds (other than direct appropriations). These consist mainly of trading revenues of government enterprises, disposals of plant, sales of publications, and residuals of appropriations retained from previous years.

To discuss trends in expenditure in terms of the levels of activity being supported, the expenditures should ideally be expressed at constant price levels, and adjustments should be made to remove the effects of any expenditure changes which did not influence the level of real activity. This is discussed further in Appendix D under the heading "Estimation of trends in real terms". The price indices used to obtain the constant price estimates in Table 1 (broad trends) and Table 11 (socio-economic objective aggregates) are presented in Table 29 of that Appendix. Figure 1 also summarises this constant price information and the same indices are applied to derive the real growth rates in various socio-economic objectives as outlined later in Chapter III. All other expenditures throughout the document are at current prices.

Projected Commonwealth Budget sector expenditure of $1007m on R&D for 1985-86 shows an increase of 8.7% relative to the 1984-85 total of $926m (Table 1). In real terms the increase is about 2.3%.

When the non-Budget sector is added in, the projected figure for all direct Commonwealth funding of R&D for 1985-86 is seen to be $1118m, showing an increase of 11.4% relative to the 1984-85 total of $1003m (Table 1). In real terms the increase is about 4.8%.

Over the period 1978-79 to 1985-86 the average real growth rate in all R&D expenditure directly funded by the Commonwealth is 2.3% per annum.

Table 1: Summary of trends in Commonwealth Government support for S&T, 1980-81 to projected 1985-86.

($ million)	R&D						S&T (including R&D)					
					Projected						Projected	
	80-81	81-82	82-83	83-84	84-85	85-86	80-81	81-82	82-83	83-84	84-85	85-86
Identifiable* Commonwealth Government Budget sector funds expended on S&T												
($m current)	638#	693	819	872	926	1007	1090#	1226	1428	1549	1649	1788
% Total Commonwealth outlays (%)	1.77	1.68	1.68	1.54	1.45	1.46	3.02	2.97	2.94	2.74	2.59	2.59
% GDP (%)	.481	.460	.495	.465	.447	.434	.821	.814	.863	.827	.796	.771
Identifiable* Commonwealth Government funds expended on S&T (including Non-Budget Sector)												
- excluding Cwlth-owned BE												
($m current)	645#	702	843	884	947	1048	1059#	1236	1460	1575	1687	1854
% GDP (%)	.486	.466	.509	.472	.457	.452	.828	.820	.882	.840	.815	.799
- including Cwlth-owned BE												
($m current)	687#	746	892	939	1003	1118	1218#	1379	1608	1717	1873	2054
% GDP (%)	.517	.479	.543	.484	.484	.482	.918	.886	.944	.888	.904	.885
($m constant 84-85 prices)	965	911	994	990	1003	1051	1713	1684	1793	1811	1872	1932
Total Commonwealth Outlays ($m)	36098	41305	48570	56570	63739	69067						
GDP ($m)	132705	150253	165306	186550	207089	231940						

BE Wholly Commonwealth-owned business enterprises.

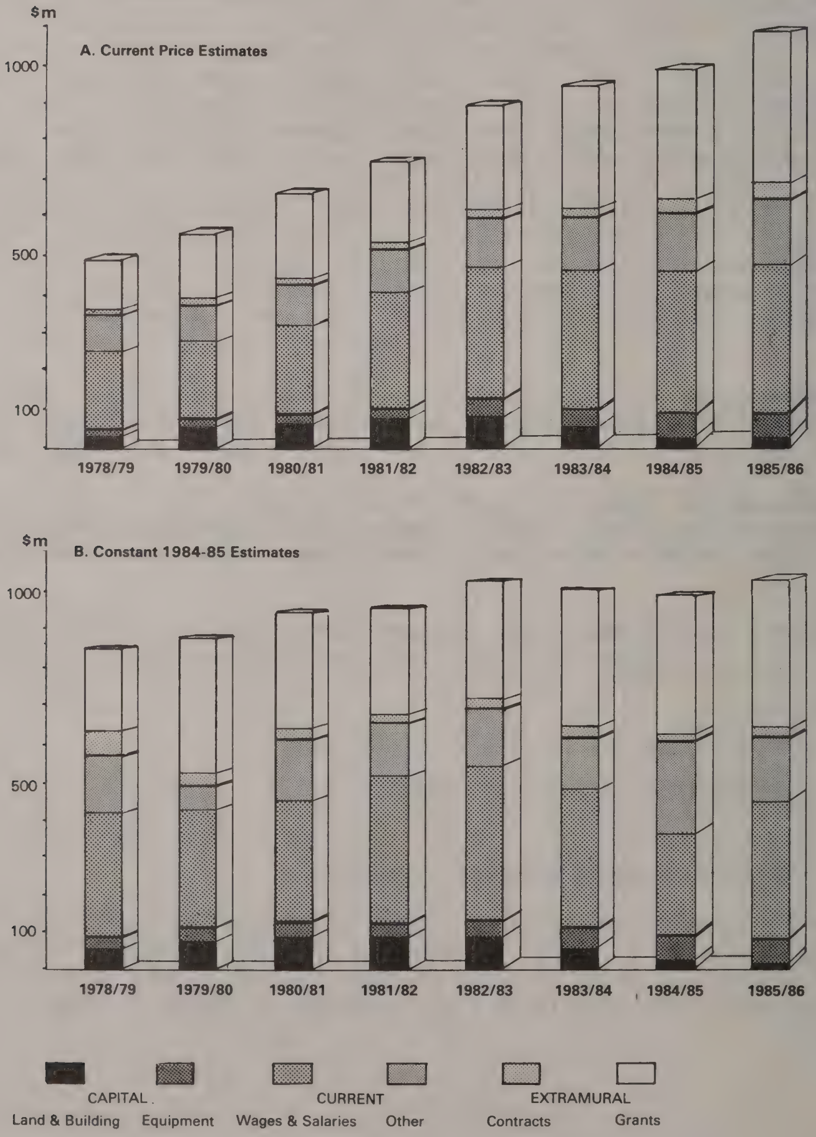
Note : Table 3 presents a breakdown of intramural expenditure by ministry and agency with major R&D performance. Table 4 presents a similar breakdown of extramural payments by ministry and major granting program. Tables 5 and 6 show the amounts of extramural payments (grants in Table 5 and contracts in Table 6) going to particular sectors.

* The data shown do not contain estimates for the research components of higher education sector teaching-and-research expenditures - see A.10.3, p 87.

# Before 1981-82, there were differing superannuation arrangements applying to certain statutory authorities, especially CSIRO and AAEC. In this table a notional increase has been applied to data for 1980-81 for trend comparison purposes. (See Science and Technology Statement 1984-85 for data without such a national increase.)

## DOS estimate, September 1985.

FIG. 1 - Commonwealth Government Funds Expended on R & D by type of Expenditure ($million)

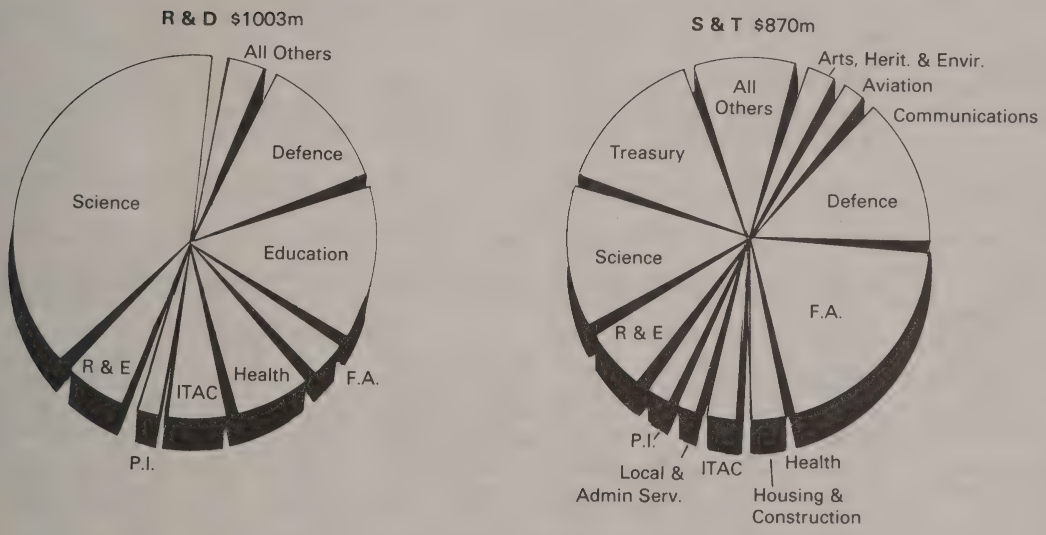


II.2 S&T Expenditure by Ministry

Table 2 is a presentation of aggregate Commonwealth funds expended on S&T by ministry. The division between Budget and Non-budget sectors mainly serves to indicate where S&T activities are supported by Parliamentary appropriation and where they are supported by the trading revenues of government business enterprises. Further dissections of S&T expenditure by ministry are provided in Tables 3 and 4.

The main trends evident in data presented by ministry in Table 2 may be compared with trends in aggregate expenditures directed towards particular socio-economic objective categories as used in the Project SCORE R&D survey. Further explanation is given in Appendix D. Fig 2 below is a visual presentation of the data presented in Table 2, for 1984-85.

Fig. 2 - Commonwealth Funding by Ministry (1984 - 85)



Commonwealth Funding of S & T Only (not including R & D)

Commonwealth Funding of R & D only by Ministry (1984 - 85)

Table 2: Estimated Commonwealth Government funds expended on S&T by ministry with prime responsibility for planning the expenditure*

($ million)	R&D						S&T (including R&D)				
					Projected					Projected	
	80-81	81-82	82-83	83-84	84-85	85-86	81-82	82-83	83-84	84-85	85-86
A. Commonwealth Budget sector net expenditure											
Aboriginal Affairs	0.92	0.62	0.53	0.45	0.53	0.43	2.75	3.00	3.39	3.47	3.58
Arts, Heritage and Environment	4.07	4.88	6.69	5.54	5.95	8.10	21.84	24.89	27.96	28.07	32.17
Attorney-General's	2.20	2.82	3.46	4.08	5.52	5.54	3.85	4.48	5.24	7.33	7.54
Aviation	1.30	1.33	1.01	1.20	1.18	1.13	17.62	24.33	23.44	22.64	19.85
Communications	0.30	0.52	0.36	0.43	0.39	0.24	1.04	1.21	1.74	1.48	1.38
Community Services	0.69	0.96	1.08	0.82	0.69	1.15	2.01	1.61	1.99	1.27	1.98
Defence	98.06	103.39	114.43	121.21	132.99	133.92	165.41	211.25	227.64	228.55	227.44
Education	88.3	98.3	113.2	126.8	138.3	151.4	101.0	115.8	130.0	141.3	155.1
Employment and Ind. Relations	0.82	1.71	0.75	1.18	2.15	4.88	2.43	1.81	2.14	3.73	7.59
Foreign Affairs**	15.27	20.03	30.13	32.85	40.41	43.35	108.18	149.49	175.12	192.74	197.26
Health	29.04	38.25	46.21	56.18	65.97	76.64	58.80	70.15	83.09	94.22	106.97
Housing & Construction	2.66	1.96	2.10	2.10	2.24	2.65	3.79	3.93	7.93	6.58	5.20
Immigration & Ethnic Affairs	0.53	0.38	0.43	0.18	0.32	0.31	3.13	3.70	4.74	4.18	3.01
Industry, Technology & Commerce	49.48	26.86	53.22	64.83	60.86	63.39	43.39	70.80	91.09	87.47	127.44
Local Government & Admin. Services	0.03	0.04	0.05	0.02	-	-	16.12	16.22	17.67	17.74	19.24
Primary Industry	18.44	18.54	20.77	24.17	27.32	35.49	31.67	37.17	41.58	66.07	74.66
P.M. & Cabinet	0.06	0.07	0.08	0.15	0.19	0.27	1.40	1.53	2.20	2.34	2.82
Resources & Energy	40.29	50.80	48.21	54.38	64.98	70.40	97.98	92.32	99.02	112.46	121.30
Science	279.38	314.31	366.09	366.33	364.64	396.46	410.11	472.25	478.10	484.19	526.71
Social Security	0.41	0.55	0.59	0.68	0.68	0.68	0.55	0.68	0.77	0.68	0.68
Special Ministry	0.19	0.22	0.51	0.41	0.43	0.39	0.44	1.20	0.93	0.58	0.66
Territories	0.28	0.32	0.37	0.50	0.52	0.52	3.86	4.17	5.90	6.26	6.88
Transport	2.89	1.86	2.25	2.28	2.18	1.40	5.68	6.92	6.59	7.11	6.38
Treasury	2.64	3.99	6.16	4.39	6.73	7.80	115.11	99.40	99.42	116.00	120.31
Veterans' Affairs	0.27	0.32	0.40	0.37	0.44	0.44	7.72	9.84	11.20	12.07	12.07
Total (Budget sector)	638.5#	693.0	819.1	871.5	925.6	1007.0	1225.8	1428.1	1549.2	1648.5	1788.2
B. Commonwealth Non-Budget sector, BE excluded											
Aboriginal Affairs	0.21	-	-	-	-	-	0.21	0.17	0.21	0.29	0.25
Arts, Heritage & Environment	-	-	-	-			0.01	0.03	..	-	0.06
Attorney General's	0.01	0.03	0.09	0.07	0.03	0.02	0.06	0.11	0.13	0.04	0.08
Defence	-	-	-	-	-	-	-	-	-	5.64	6.30
Education	0.28	0.17	0.06	0.04	0.08	0.10	0.39	0.84	0.35	0.36	0.44
Foreign Affairs	-	-	-	-	-	0.52	-	-	-	-	0.90

($ million)	R&D						S&T (including R&D)				
					Projected					Projected	
	80-81	81-82	82-83	83-84	84-85	85-86	81-82	82-83	83-84	84-85	85-86
Housing & Construction	0.07	0.05	0.06	0.02	0.27	0.50	0.05	0.07	0.02	0.30	0.54
Immigration & Ethnic Affairs	..	0.01	0.02	-	-	-	0.02	0.04	0.02	0.06	0.08
Industry, Technology & Commerce	-	-	-	-	-	-	-	-	0.01	0.03	0.04
Local Government & Admin. Services	0.05	0.05	0.12	0.05	0.09	0.10	0.06	0.15	0.07	0.93	1.02
Primary Industry	-	-	-	-	1.29	10.20	-	-	-	1.44	10.49
Resources & Energy	-	-	11.69	1.08			-	16.28	3.56	4.09	6.18
Science	6.47	7.62	12.08	11.03	19.58	30.44	10.58	14.25	11.56	23.69	37.40
Territories	0.04	0.03	0.01	0.04	0.02	0.06	0.16	0.17	0.22	0.21	0.29
Treasury	-	-	-	-	0.12	-	-	-	-	1.02	1.20
Total (Non-Budget, ex-BE)	7.11#	7.96	24.13	12.32	21.37	41.30	11.54	32.11	16.15	38.10	66.75
Total (Direct Commonwealth funding, ex-BE)	645.6	701.0	843.2	883.8	947.0	1048.3	1237.3	1460.2	1565.3	1686.6	1853.5
C. Commonwealth Non-Budget sector, BE only											
Communications	37.3	39.7	44.1	44.2	47.0	59.3	82.4	90.4	96.1	110.9	137.3
Health	2.08	2.43	2.70	3.46	3.63	3.64	2.69	3.06	3.82	4.12	4.12
Housing & Construction	0.01	-	-	-	-	-	54.20	52.06	44.23	64.81	50.98
Treasury (Financial) Enterprise sector)	1.63	2.47	2.09	7.13	5.77	6.31	2.61	2.33	7.90	6.89	7.55
Total (BE only)	41.0	44.6	48.9	54.8	56.4	69.2	141.9	147.9	152.0	186.7	200.0
Total (All Non-Budget)	47.6#	52.5	73.0	67.1	77.8	110.5	153.4	179.9	168.2	224.8	265.3
Total (All direct Commonwealth funding)	686.6#	745.6	892.1	938.6	1003.4	1117.5	1379.2	1608.0	1717.3	1873.3	2053.5

* See Tables 3 and 4 for more detailed dissections of expenditure by ministry.

** Mostly represented by the S&T component of Australia's development assistance program (see A.12).

# See note under Table 1.

II.3 Overview of Major R&D agencies and granting programs

Tables 3 and 4 (which combine the Budget and Non-Budget sectors) show intramural S&T expenditure within Commonwealth bodies (Table 3), with the larger agencies separately identified, and extramural payments (Table 4) with major R&D granting programs shown.

Table 3: Intramural Commonwealth Government expenditure on S&T by ministry, showing agencies with major R&D performance

($ million)	R&D						S&T (including R&D)				
					Projected					Projected	
	80-81	81-82	82-83	83-84	84-85	85-86	81-82	82-83	83-84	84-85	85-86
Aboriginal Affairs	0.57	-	-	-	-	-	2.06	2.24	2.50	2.33	2.51
Arts, Heritage and Environment											
. Supervising Scientist	3.04	3.71	5.67	4.26	4.40	6.27	3.71	5.67	4.26	4.40	6.27
. Other	0.08	0.14	0.22	0.25	0.24	0.27	16.27	16.99	20.03	19.33	20.53
Attorney-General's	1.87	2.51	3.19	3.99	5.24	5.26	3.57	4.23	5.20	6.89	7.07
Aviation	1.06	0.98	0.73	0.80	0.79	0.77	4.09	7.96	7.37	6.35	3.40
Communications											
. Telecom	34.8	38.0	41.7	41.2	43.3	51.2	74.5	81.1	82.8	93.2	114.2
. Other	1.82	0.87	1.15	1.59	2.06	3.78	2.40	3.53	4.60	4.91	6.68
Community Services	0.54	0.72	0.61	0.68	0.66	0.80	1.21	0.87	0.86	0.95	1.09
Defence	98.06	102.64	113.38	120.30	131.88	138.86	148.03	191.86	205.29	230.22	230.13
Education	1.02	0.81	0.48	0.59	1.09	1.08	2.20	1.14	1.37	1.23	1.25
Employment & Ind. Relations	0.78	1.60	0.69	0.79	1.34	1.51	2.10	1.48	1.54	2.21	2.85
Foreign Affairs	-	-	-	-	-		1.99	2.72	3.58	3.45	4.25

($ million)	R&D						S&T (including R&D)				
					Projected					Projected	
	80-81	81-82	82-83	83-84	84-85	85-86	81-82	82-83	83-84	84-85	85-86
Health											
. Aust. Radiation Lab.	1.78	2.11	2.78	2.41	2.58	2.63	3.16	4.03	4.02	4.30	4.39
. Inst. of Health	2.19	2.06	2.37	2.62	3.02	3.23	3.02	3.47	3.84	4.38	4.67
. Comm. Serum Lab.	3.22	3.87	5.00	5.50	6.22	6.24	4.51	5.79	6.37	6.91	6.92
. National Biol. Standards Lab.	2.29	2.27	2.69	3.14	3.55	3.98	4.90	5.53	6.46	7.19	7.92
. Other	2.27	1.86	2.31	3.51	2.34	2.83	15.83	19.33	22.30	23.35	25.55
Housing & Construction	2.32	1.88	2.01	2.01	2.34	2.73	56.71	54.11	52.06	71.53	56.29
Immigration & Ethnic Affairs	0.16	0.12	0.20	0.04	0.10	0.09	2.42	3.09	3.94	3.18	2.36
Industry Technology & Commerce	1.29	1.72	1.63	2.01	2.34	2.54	11.06	8.86	11.30	9.88	12.02
Local Government and Administrative Services	0.07	0.07	0.09	0.05	0.09	0.09	14.74	14.80	15.79	16.82	18.23
Primary Industry	1.26	1.56	1.79	2.13	2.43	2.18	11.90	12.08	13.09	21.17	19.58
P.M. & Cabinet	-	-	-	0.01	0.01	0.01	1.19	1.34	1.91	2.13	2.55
Resources & Energy											
. AAEC	22.49	25.65	29.54	24.11	27.75	30.32	37.39	39.24	34.58	44.27	46.87
. BMR	9.54	13.63	16.56	16.29	23.98	27.20	19.59	21.90	21.81	30.30	34.10
. Other	0.02	0.03	0.10	0.13	0.08	0.04	16.58	19.17	17.86	14.18	17.06
Science											
. AATB (Australian funds only)	1.64	1.62	1.82	1.73	1.57	1.64	1.63	1.82	1.73	1.57	1.64
. Antarctic Div.	12.39	12.08	17.45	18.61	21.30	22.96	21.91	32.03	35.21	37.12	39.59
. AIMS	5.22	5.76	6.54	7.02	7.50	7.58	5.76	6.54	7.02	7.50	7.58
. CSIRO	245.03	273.17	314.88	321.16	318.91	353.91	273.17	314.88	321.54	335.81	373.01
. Other	1.47	7.98	14.13	2.47	2.73	2.83	95.26	105.54	96.07	89.47	99.50
Social Security	-	-	-	-	-		-	0.09	0.09	-	-
Special Ministry	-	0.03	0.41	0.28	0.28	0.28	0.12	0.97	0.60	0.33	0.33
Territories	0.30	0.34	0.36	0.51	0.52	0.56	3.92	4.21	5.81	6.18	6.69
Transport	0.11	0.07	0.19	0.45	0.46	0.31	3.16	3.84	3.82	3.60	3.61
Treasury											
. ABS	2.55	3.89	6.08	4.33	5.40	5.14	113.87	97.44	98.44	116.94	120.97
. Other	0.33	0.41	0.26	4.48	2.81	3.55	1.68	2.35	6.15	3.92	4.78
Veterans' Affairs	0.27	0.32	0.40	0.37	0.44	0.44	7.72	9.84	11.20	12.07	12.07
Total (Direct Commonwealth funding of intramural expenditure)	461.4#	514.5	597.4	599.8	631.0	689.3	993.3	1112.0	1142.4	1249.5	1328.6

NOTE: The table does not purport to show the total amount of expenditure for the agencies identified. Funds sourced to other than Budget and Non-Budget sectors are excluded (see Ministry tables - Appendix A), as are R&D contracted out and grant payments (see Table 4).

# See note under Table 1.

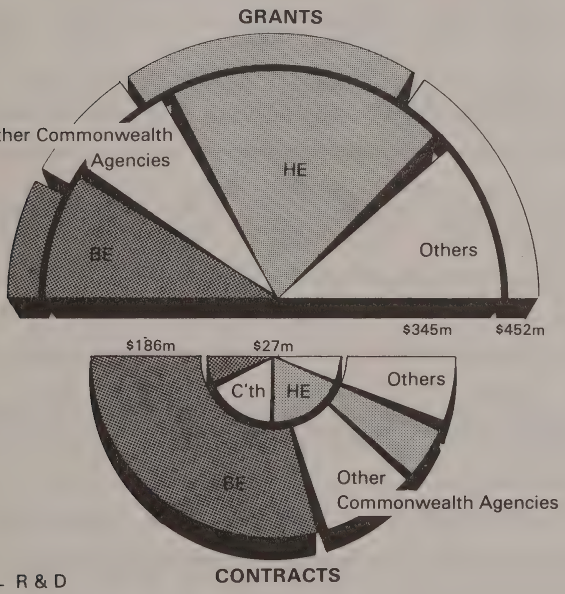
Table 4: Extramural Commonwealth Government expenditure on S&T by ministry, showing major extramural R&D funding programs

($ million)	R&D						S&T (including R&D)				
					Projected					Projected	
	80-81	81-82	82-83	83-84	84-85	85-86	81-82	82-83	83-84	84-85	85-86
Aboriginal Affairs	0.56	0.62	0.53	0.45	0.53	0.43	0.91	0.92	1.10	1.43	1.32
Arts, Heritage and Environment	0.94	1.02	0.80	1.04	1.31	1.56	1.86	2.26	3.67	4.33	5.44
Attorney-General's	0.34	0.34	0.36	0.16	0.31	0.29	0.34	0.36	0.17	0.48	0.54
Aviation	0.24	0.34	0.29	0.41	0.39	0.36	13.53	16.38	16.06	16.28	16.45
Communications	0.94	1.33	1.58	1.84	1.99	4.55	6.54	6.98	10.40	14.31	17.84
Community Services	0.15	0.24	0.46	0.14	0.37	0.35	0.80	0.73	1.14	0.31	0.89
Defence	0.40	0.74	1.05	0.91	1.12	1.06	17.38	19.40	22.35	3.97	3.62
Education											
. Post-grad. awards	7.76	8.54	11.17	14.60	15.42	17.28	9.58	12.57	16.48	17.21	19.29
. Special Research Grants	77.0	86.5	99.9	109.7	119.7	131.0	86.5	99.9	109.7	119.7	131.00
. Other	2.84	2.64	1.73	2.52	3.23	3.21	5.27	4.12	4.47	4.78	5.24
Employment & I.R.	0.03	0.11	0.06	0.39	0.80	3.37	0.33	0.33	0.61	1.53	4.74
Foreign Affairs											
. ACIAR	-	-	0.96	4.75	8.62	11.52	-	1.11	7.00	9.46	12.47
. ADAB	14.88	19.82	28.79	27.72	31.35	31.90	105.17	144.43	163.26	178.52	179.95
. Other	0.38	0.21	0.38	0.38	0.45	0.45	1.02	1.23	1.28	1.31	1.49
Health											
. NH&MRC	18.70	25.65	29.56	37.98	44.18	50.78	25.65	29.56	37.98	44.18	50.78
. Other	0.67	2.86	4.20	4.48	7.72	10.59	4.42	5.49	5.94	8.03	10.59
Housing & Construction	0.42	0.14	0.15	0.12	0.16	0.43	1.33	1.95	0.12	0.16	0.43
Immigration & E.A.	0.37	0.27	0.25	0.14	0.23	0.23	0.73	0.65	0.82	1.06	0.73
Industry Technology & Commerce	2.47	3.39	3.72	5.01	4.14	5.43	10.58	14.07	21.98	23.24	60.03
. AIRDIB	45.71	21.75	47.87	57.81	54.39	55.42	21.75	47.87	57.81	54.39	55.42
Local Government and Admin Services	0.02	0.02	0.08	0.03	..	0.01	1.44	1.57	1.95	1.84	2.02
Primary Industry											
. Rural Research	14.67	16.27	18.02	20.68	21.14	38.08	18.23	21.97	24.27	21.58	38.67
. Other	2.52	0.72	0.96	1.36	5.04	5.43	1.54	3.13	4.23	24.76	26.90
P.M. & Cabinet	0.06	0.07	0.08	0.13	0.18	0.26	0.21	0.19	0.29	0.21	0.27
Resources & Energy											
. Energy R,D&D grants	6.35	9.27	11.69	13.72	12.29	11.62	10.41	13.87	16.29	15.21	14.37
. Other	1.88	2.21	2.01	1.21	0.87	1.22	14.01	14.42	12.07	12.59	15.09
Science											
. AMSTAC-QEII fellowships	2.00	3.80	4.19	4.47	5.04	5.46	3.80	4.19	4.47	5.04	5.46
. ARGC	15.20	16.99	18.74	21.24	23.14	25.70	16.99	18.74	21.44	23.14	25.70
. Other	2.90	0.53	0.42	0.67	4.03	6.82	2.17	2.76	2.18	8.23	11.67
Social Security	0.41	0.55	0.59	0.68	0.68	0.68	0.55	0.59	0.68	0.68	0.68
Special Ministry	0.19	0.19	0.11	0.13	0.15	0.11	0.32	0.23	0.33	0.25	0.31
Territories	0.02	0.01	0.02	0.02	0.02	0.02	0.09	0.14	0.31	0.29	0.48
Transport	2.77	1.79	2.07	1.83	1.72	1.10	2.52	3.08	2.76	3.51	2.78

($ million)	R&D						S&T (including R&D)				
					Projected					Projected	
	80-81	81-82	82-83	83-84	84-85	85-86	81-82	82-83	83-84	84-85	85-86
Treasury											
. Reserve Bank grants	1.39	2.16	1.92	2.72	3.01	3.20	2.17	1.94	2.73	3.02	3.21
otal (Direct Commonwealth funding of extramural expenditure)	225.2	231.1	294.7	338.8	372.4	428.8	385.9	496.0	574.9	623.9	724.9

I.4 Destination of extramural S&T Funding

FIG. 3 - Destination of the Extramural Expenditures directly funded by Commonwealth (1984-85)



Inner circle - R & D
Outer circle - S & T (including R & D)

Extramural expenditure consists of grants and contracts. These categories are defined in Appendix D. Table 5 is a summary of the amounts of Commonwealth grants for S&T purposes by sector of recipient. Table 6 is a similar summary of contracts. More detailed data by ministry is given in Appendix B, tables 23 to 26.

Table 5: Commonwealth S&T grants by recipient sector, 1980-81 to projected 1985-86

($ million)		R&D						S&T (including R&D)					
		80-81	81-82	82-83	83-84	84-85	Projected 85-86	80-81	81-82	82-83	83-84	84-85	Projected 85-86
Private Enterprise	N	48.36	26.53	54.62	67.66	63.68	66.93	52.52	30.83	59.93	74.39	70.75	110.07
	S	0.07	0.02	0.02	0.07	0.01	0.27	0.07	0.02	0.02	0.09	0.08	0.35
	N+S	48.43	26.55	54.64	67.73	63.69	67.20	52.59	30.86	59.96	74.48	70.83	110.42
Commonwealth Agencies	N	#	11.19	11.53	12.64	10.87	19.97	#	12.82	14.83	15.02	11.58	20.59
	S	#	0.32	0.10	0.01	0.01	0.01	#	0.32	0.10	0.01	0.01	0.01
	N+S	#	11.51	11.63	12.65	10.87	19.98	#	13.13	14.93	15.03	11.58	20.60
Higher Education	N	87.4	98.8	116.5	131.7	150.8	172.7	95.3	109.1	130.9	152.9	179.2	203.1
	S	27.3	32.6	35.3	39.0	41.9	45.3	36.5	42.4	47.5	49.7	57.2	58.6
	N+S	114.7	131.4	151.8	170.8	192.7	218.0	131.8	151.6	178.4	202.6	236.4	261.7
Other Bodies	N	40.63	38.95	49.57	55.53	65.69	75.68	70.18	67.44	88.45	94.87	108.81	120.24
	S	8.78	8.06	9.03	10.36	11.82	12.47	16.50	19.92	25.59	24.75	24.01	24.26
	N+S	49.41	47.01	58.60	65.89	77.51	88.15	86.68	87.36	114.03	119.63	132.83	144.49
Total (Direct Commonwealth funding all grants)		212.5	216.5	276.7	317.1	344.8	393.3	271.0	283.0	367.3	411.7	451.6	537.2

N Natural sciences and engineering
S Social sciences and humanities
N+S Total natural sciences and engineering, social sciences and humanities
# Prior 1981-82 grants to other Commonwealth agencies are included within Other Bodies"

Table 6: Commonwealth S&T contracts by recipient sector, 1980-81 to projected 1985-86

($ million)		R&D						S&T (including R&D)					
						Projected						Projected	
		80-81	81-82	82-83	83-84	84-85	85-86	80-81	81-82	82-83	83-84	84-85	85-86
Private Enterprise	N	0.93	1.71	2.31	1.57	1.76	3.29	35.41	50.18	58.15	91.41	77.37	81.30
	S	0.43	0.67	0.55	0.49	0.48	0.52	1.46	2.10	2.90	3.16	5.64	4.65
	N+S	1.36	2.38	2.86	2.06	2.24	3.81	36.88	52.28	61.05	94.57	83.01	85.96
Commonwealth Agencies	N	3.92	5.53	6.08	7.92	8.84	10.40	18.99	35.11	46.27	35.98	38.66	40.21
	S	0.03	0.06	0.08	0.46	0.69	1.01	0.12	0.42	2.18	3.57	3.68	3.59
	N+S	3.95	5.58	6.16	8.38	9.54	11.40	19.10	35.53	48.44	39.55	42.34	43.80
Higher Education	N	2.67	4.80	6.45	7.95	9.60	11.86	4.64	7.15	9.81	15.43	16.11	18.39
	S	1.03	0.72	0.89	0.76	1.27	1.54	1.61	1.26	1.63	1.88	2.94	3.43
	N+S	3.70	5.52	7.33	8.71	10.87	13.41	6.24	8.41	11.44	17.31	19.05	21.82
Other Bodies	N	3.33	0.65	1.19	2.10	4.20	5.95	25.61	6.15	7.05	10.59	27.16	32.77
	S	0.33	0.46	0.45	0.49	0.54	0.68	0.66	0.64	0.64	1.21	1.27	2.10
	N+S	3.66	1.11	1.63	2.59	4.74	6.64	26.27	6.79	7.69	11.80	28.42	34.87
Total (Direct Commonwealth funding all contracts)		12.68	14.59	17.98	21.74	27.39	35.26	88.49	103.01	128.62	163.23	172.82	186.45

N Natural sciences and engineering
S Social sciences and humanities
N+S Total natural sciences and engineering, social sciences and humanities

II.5 Commonwealth S&T expenditures by discipline-related categories

From time to time requests have been made for Science and Technology Statement data to be disaggregated by discipline or field of Science. If precise figures are sought, this presents difficulties of many kinds which could be satisfactorily resolved only by a full-scale R&D survey. As an experiment, however, an ad hoc system of classification has been derived. The results, in Table 7, should be used with caution. See D.9 for further details.

Table 7 : Commonwealth Expenditures (Budget only) on S&T by discipline-related categories 1981-82 to 1985-86 (projected)

	R&D					S&T (including R&D)	
	81-82	82-83	83-84	84-85 $m	Projected 85-86	84-85	Projected 85-86
Engineering & Technology - Defence Application	104	115	122	133	134	229	228
Engineering & Technology - Resources Application	29	29	31	31	34	38	48
Engineering & Technology - Technology-intensive Industry	97	128	130	148	162	180	231
Engineering & Technology - Services Applications	14	19	19	20	21	59	54
Physics and Mathematics	25	32	37	37	43	43	51
Atmospheric and Space Science	4	5	5	5	7	92	100
Energy Disciplines	53	58	69	64	65	88	89
Chemistry (NEI)	19	22	25	87	31	40	44
Earth Resources	42	57	66	58	61	110	120
Water Resources & Physical Environment	26	38	33	31	35	40	44
Marine Science	26	29	36	35	40	40	45
Applied Biology and Living Environment	9	11	14	14	17	29	33
Health & Medical Sciences	46	55	65	79	91	125	139
General Biology (NEI)	14	18	21	21	25	25	30
Rural Sciences	130	143	133	147	159	265	283
Subtotal NSE	638	759	816	850	925	1403	1534

	R&D					S&T (including R&D)	
	81-82	82-83	83-84	84-85 $m	Projected 85-86	84-85	Projected 85-86
Business & Information Sciences	17	20	21	26	27	170	172
Humanities & Social Sciences	38	40	45	50	55	76	82
Subtotal SSH	55	60	66	76	82	246	254
TOTAL (budget expenditure only)	693	819	872	926	1007	1649	1788

II.6 Commonwealth Contribution to Gross Domestic Expenditure on R&D (GERD)

Table 8, based on the Project SCORE surveys of R&D performers in all sectors, shows the contribution of each sector to funding GERD. The SCORE surveys have shown that Commonwealth Government support for R&D activities rose substantially between 1968-69 and 1973-74 and again rose in real terms between 1973-74 and 1976-77; and between 1976-77 and 1978-79. The sharp initial rise was due primarily to changed administrative arrangements between the Commonwealth and States for funding higher education. The 1981-82 survey results (when adjusted to remove certain expenditure for that year which did not correspond to an increased level of activity) show the level of Commonwealth support remaining at approximately the same level as in 1978-79. When the general government sector as a whole is considered (i.e., Commonwealth plus States), the picture is similar to that presented by Commonwealth funding alone. For funding of R&D by the States alone, the 1981-82 survey indicates a small decrease in real terms. Table 12 (section IV.1) giving some Australian trends as % GDP, rather than % GERD, shows a more accentuated decrease.

In contrast to the relative stability of support by government, private enterprise funding of R&D fell sharply between 1973-74 and 1976-77. This reduced the private enterprise share of funding of the gross domestic expenditure on R&D (GERD) from 28% to 17%, and correspondingly increased the Commonwealth Government share from 58% to 66%. These shares have remained at about the same levels since that time.

able 8: Commonwealth Government and other sector funding contributions to Australia's gross domestic expenditure on R&D (GERD): 1968-69 to 1983-84

ector of Funding	1968-69	1973-74	1976-77	1978-79	1981-82	Estimated** 1983-84
				($m)		
ommonwealth Government						
- General Government	n.a.	n.a.	541	666	938#	1190
- Public Enterprise*	n.a.	n.a.	38	29	45	55
Sub-total	173	383 ##	579	695	983#	1245
tate Government						
- General Government	n.a.	n.a.	111	140	179	210
- Public Enterprise*	n.a.	n.a.	6	8	10	13
Sub-total	61	67 ##	117	148	194	223
Private Enterprise	116	186	152	180	265	302
Other Australian	9	7	10	18	32	35
Overseas	10	11	14	13	16	20
Total (GERD)	368	655	873	1054	1485#	1820
Commonwealth Government funding as % GERD	(%) 47	58 **	66	66	66	68
State Government funding as % GERD	(%) 17	10 **	13	14	13	12
Private Enterprise funding as % GERD	(%) 32	28	17	17	18	17

Note: Table 7 is based on Project SCORE and includes the imputed research component of higher education teaching-and-research expenditures. All other tables exclude this imputed component (see A.10.2). For consistency with later practice some other adjustments have been made to figures for the first three surveys.

# A downward adjustment of $37m has been made to allow valid trend comparisons on the level of support for R&D activities. The adjustment allows for changed superannuation arrangements ($27m) and an additional pay period in 1981-82 ($10m) for Commonwealth bodies.

## Much of the large rise in Commonwealth funding between 1968-69 and 1973-74 is due to changed funding arrangements for universities from States to Commonwealth.

* The attribution of public business enterprise funding between Commonwealth owned and State owned enterprises is based on estimates by the Department of Science.

** Estimates made by DOS, based on data from the present Statement and from the ABS Publication No 8114.1 "Research and Experimental Development, Business Enterprises - 1983-84".

Fig. 4A - **Funding contribution to Australia's Gross Domestic Expenditure on R & D (GERD) DoS Estimates for 1983-84** ($Millions)

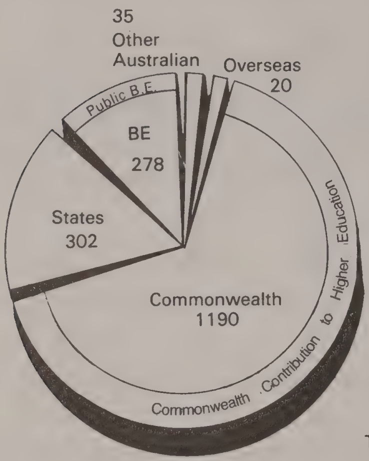
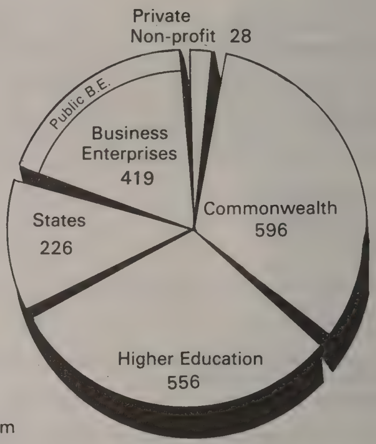


Fig.4B - **Sectorial Performance of Gross Domestic Expenditures on R & D (GERD) DoS Estimates for 1983-84** ($Millions)



TOTAL GERD $1825m

Table 9: Sectorial Performance on Gross Domestic Expenditures on R&D (GERD) : 1968-69 to 1983-84

Sector of Performance	1968-69	1973-74	1976-77	1978-79	1981-82	Estimated** 1983-84
				($m)		
Commonwealth Government						
- General government	n.a.	n.a.	289	321	478#	596
- Public enterprise*	n.a.	n.a.	37	32	42	56
Sub-total	117	208	326	353	517#	647
State Government						
- General government	n.a.	n.a.	126	149	194	226
- Public enterprise*	n.a.	n.a.	6	8	13	15
Sub-total	41	76	132	157	207	241
Private business enterprise	119	191	160	206	286	348
Higher education	89	174	244	326	452	556
Private non-profit	2	6	11	13	21	28
Total (GERD)	368	655	873	1054	1485#	1820
General Government Performance as % GERD	n.a.	n.a.	48	45	45	45
Business Enterprise (including Public) Performance as % GERD	n.a.	n.a.	23	23	23	23
Higher Education Performance as % GERD	24	27	28	31	30	30

# A downward adjustment of $37m has been made to allow valid trend comparisons on the level of support for R&D activities. The adjustment allows for changed superannuation arrangements ($27m) and an additional pay period in 1981-82 ($10m) for Commonwealth bodies.

* The attribution of public business enterprise funding between Commonwealth owned and State owned enterprises is based on estimates by the Department of Science.

Sources: Figures are based on:

- Project SCORE 1968-69, 1973-74, 1976-77, 1978-79
- Research and Experimental Development - All sector Summary, Australia 1981-82, ABS Catalogue No. 8112.0 (3 April 1984).
- Research and Experimental Development - General Government Organisations, Australia, 1981-82, ABS Catalogue No. 8109.0 (27 January 1984).
- Research and Experimental Development, Business Enterprises, Australia 1981-82, ABS Catalogue No. 8104.0 (1 March 1984).
- Research and Experimental Development, Higher Education Organisations, Australia, 1981, ABS Catalogue No. 8111.0 (6 October 1983).
- Research and Experimental Development - Business Enterprises - Australia - Estimates 1983-84, ABS Catalogue No 8114.0 (7 June 1985).
- Quarterly Estimates of National Income and Expenditure, Australia - September Quarter, 1984, ABS Catalogue No. 5206.0 (4 December 1984).

CHAPTER III

R&D TRENDS AND DEVELOPMENTS BY SOCIO-ECONOMIC OBJECTIVE

III.1 Presentation of Trends

The discussion of trends is subject to a number of problems and associated choices. The period of time over which the trend is taken is obviously a major determinant of any percentage increase/decrease which may be derived. Then, should one estimate the trend overall simply by looking at the expenditure level at the beginning and end of the period, or should some smoothing procedure be utilised so that all the data are used? Further, are there some expenditure components which may perhaps confuse rather than enlighten?

There is no generally accepted procedure for dealing with these issues. Usually, the problems are avoided either by not discussing trends at all, or by presenting year-on-year percentage changes.

In this Chapter we have adopted the following approach. Both long- and short-term trends are given. These are derived using a consistent smoothing technique so that all data are utilised.

All trends shown are on an annual average basis. There is a "lumpiness" introduced into expenditure time series by large capital expenditures for major facilities. Thre trend data therefore need to be considered with some caution.

III.2 Recent Developments

Under most objective headings there is a presentation of relevant items which have come to notice. Sometimes these are highlights of research completed over the past year; sometimes they are developments of other kinds (policy initiatives, problems etc.) which have had, or which are likely to have implications for research directed towards the particular objective.

III.3 Summary Data

Table 10, which combines the Budget and Non-budget sectors, shows Commonwealth R&D expenditures at current prices directed towards the various socio-economic objective categories. Table 11 presents the same data as Table 10, but in real terms (constant 84-85 dollars).

Table 10: Total Commonwealth Government expenditure on R&D by socio-economic objective* Current Prices

				($m)		Projected		
Objective Category	1978-79**	1979-80**	1980-81**	1981-82	1982-83	1983-84	1984-85	85-86
National security								
. Defence	79.18	85.42	98.06	103.39	114.43	121.21	132.99	133.
Economic development								
. Agriculture	69.12	91.97	109.14	120.63	128.78	115.09	126.86	147.
. Other p.i.	12.33	14.33	14.61	17.40	19.72	26.13	25.09	29.
. Mining	15.35	13.41	17.38	23.12	20.46	22.37	22.51	24.
. Manufacturing	66.62	77.45	101.03	86.90	117.01	115.30	131.09	142.
. Construction	8.02	7.65	7.63	7.73	8.36	8.27	10.33	11.
. Energy	28.88	33.74	42.20	52.51	68.37	67.09	63.38	64.
. Transport	4.75	4.92	4.64	3.50	3.51	3.55	3.43	2.
. Communications	27.67	28.58	37.65	40.30	44.55	44.72	47.45	59.
. Econom serv nei	12.79	14.89	17.41	17.33	18.17	22.73	30.44	35.
Sub-total	245.5	286.8	351.6	369.4	428.9	425.3	460.6	517.
Community welfare								
. Urb & Reg .Pl.	1.44	1.78	1.41	1.79	2.95	2.62	2.58	2.
. Environment*	16.34	19.99	20.36	24.85	36.65	31.84	30.95	35.
. Health	26.78	30.24	35.66	44.90	55.42	66.11	78.65	92.
. Education#	3.62	3.26	4.06	3.85	2.56	2.98	3.90	3.
. Welfare	0.91	1.19	1.76	2.04	3.32	1.96	2.61	3.
. Commun serv n.e.i.								
- O/seas Dev assistance	12.40	12.47	15.37	17.96	27.81	30.76	37.74	42.
- Oth Comm Serv	2.35	2.57	3.42	5.48	6.40	7.40	9.27	7
Sub-total	63.8	71.5	82.0	100.9	135.1	143.7	165.7	188
Advancement of knowledge								
. Earth, Ocean & Atmosphere	27.94	32.36	42.27	45.99	61.72	68.22	63.21	66
. General advancement of knowledge	94.63	100.09	112.55	125.92	151.88	180.28	180.95	211
Sub-total	122.6	132.5	154.8	171.9	213.6	248.5	244.2	277
Total	511.1	576.3	686.6	745.6	892.1	938.6	1003.4	1118

* See of Appendix B.1 for more detailed dissections of expenditure by socio-economic objective. See Table 13 for international comparisons of R&D expenditure by OECD objective category. See Table 11 for constant price estimates.

* Before 1981-82, there were differing superannuation arrangements applying to certain statutory authorities (especially CSIRO and AAEC) with the effect that superannuation payments were not included in the expenditure for such authorities. In this table notional increases have been applied to data for 1978-79, 1979-80 and 1980-81 for trend comparision purposes. (See Science and Technology Statement 1984-85 for data without such notional increases).

R&D funded by the Minister for Education for the purpose of producing qualified researchers or for supporting normal academic activities has been included in "General advancement of knowledge". Only research mainly directed towards education processes or education administration has been included in the "Education" objective.

Table 11: Total Commonwealth Government expenditure on R&D by socio-economic objective* Constant (1984-85) Prices

				($m)				Projected
Objective Category	1978-79**	1979-80**	1980-81**	1981-82	1982-83	1983-84	1984-85	85-86
National security								
. Defence	137.30	135.59	138.42	124.96	126.62	127.30	132.99	126.42
Economic development								
. Agriculture	119.30	146.00	154.09	148.38	142.98	121.20	126.86	138.9
. Other p.i.	21.25	22.68	20.63	21.14	21.88	27.54	25.09	27.4
. Mining	26.47	21.25	24.50	28.01	22.65	23.48	22.51	23.5
. Manufacturing	117.81	124.51	144.01	106.67	132.30	121.97	131.09	133.5
. Construction	13.84	12.13	10.74	9.33	9.25	8.69	10.33	11.2
. Energy	49.92	53.48	59.55	63.99	76.02	70.66	63.38	60.9
. Transport	8.07	7.62	6.40	4.28	3.92	3.74	3.43	2.4
. Communications	47.61	45.17	53.25	49.06	49.48	47.01	47.45	56.2
Economic serv nei	21.86	23.47	24.51	21.02	20.11	23.85	30.44	33.5
Sub-total	426.1	456.3	497.6	451.9	478.5	448.1	460.6	487.9
Community welfare								
. Urban & reg plann	2.48	2.83	1.99	2.16	3.26	2.75	2.58	2.5
. Environment*	28.16	31.61	28.75	30.19	40.60	33.48	30.95	33.2
. Health	45.80	47.57	49.52	54.90	61.81	69.94	78.65	86.9
. Education#	6.17	5.11	5.60	4.90	2.94	3.17	3.90	3.6
. Welfare	1.57	1.89	2.45	2.48	3.69	2.07	2.61	3.3
. Community services n.e.i.								
- O/seas development assistance	21.46	19.60	21.42	25.10	34.46	34.56	37.74	39.7
- Other comm serv	4.04	4.07	4.82	4.10	4.20	5.89	9.27	7.5
Sub-total	109.7	112.7	114.5	123.7	150.9	151.9	165.7	177.1
Advancement of knowledge								
. Earth, ocean and atmosphere	48.09	51.21	59.66	56.06	68.58	71.85	63.21	62.6
. General advancement of knowledge	160.10	156.03	154.53	154.84	169.83	190.71	180.95	197.3
Sub-total	208.2	207.2	214.2	210.9	238.4	262.6	244.2	259.9
Total	881.3	911.8	964.8	911.4	994.4	989.9	1003.4	1051.3

* See Table 13 for international comparisons of R&D expenditure by OECD objective category. See Table 29 and comments (Appendix D.10) for explanation of the constant price estimates.

[**] Before 1981-82, there were differing superannuation arrangements applying to certain statutory authorities (especially CSIRO and AAEC) with the effect that superannuation payments were not included in the expenditure for such authorities. In this table notional increases have been applied to data for 1978-79, 1979-80 and 1980-81 for trend comparision purposes. (See Science and Technology Statement 1984-85 for data without such notional increases).

[#] R&D funded by the Minister for Education for the purpose of producing qualified researchers or for supporting normal academic activities has been included in "General advancement of knowledge". Only research mainly directed towards education processes or education administration has been included in the "Education" objective.

III.4 DEFENCE ($133.9m projected for 1985-86)

Major Programs

All R&D under this heading is the responsibility of the Department of Defence.

Growth Trends

- Long-term trend (1979-80 to projected 1985-86): -1.1% pa
- Short-term trend (1983-84 to projected 1985-86): -0.3% pa

Recent Developments

In early 1985 the former Department of Defence Support was merged into the Department of Defence.

R&D activity during 1985 has included:

- Navy
    - Project Winnin (a hovering rocket which lures sea-skimming rockets away from ships) is now in the engineering development stage;
    - prototypes of new logging, sounding and data acquisition systems are now under trial at sea - although developed in view of increasing the RAN's anti-submarine capability, they also apply to hydrographic and oceanographic activities for peaceful purposes;
    - development of special gunmounts and full cycle support and maintenance in Australia at the newly adopted OTO-Melara 76/75 rapid fire gun;
    - improvement of the box-launched missile Ikara, to meet the standards required by overseas navies interested in its purchase.
- Army
    - development of a new type of synthetic rubber for the tracks of armoured vehicles;
    - development of new automatic stereophotogrammetric equipment;
    - new ammunition load packages, and new field ration, better suited to tropical conditions;
    - field trial, in July 1985, of the first two pre-production guns of Project Hamel (new 105mm field gun).
- RAAF
    - studies for fitting the GBU-15 bomb to the F-111C aircraft;
    - continuing development of the infrastructures and methods for the assembly in Australia of the F-18 Hornet fighter - the first of these aircraft entered into service with the RAAF on 4 May 1985;
    - improvement of the basic aircraft trainer Wamira, whose first flight is planned to be made by the end of 1985.

II.5 AGRICULTURE ($147.4m projected for 1985-86)

ajor programs

SIRO accounts for about 72% of R&D expenditure under this heading with the Rural Research rust Funds administered by the Department of Primary Industry accounting for most of the alance (wool, 6%; meat, 4%; wheat, 5%; and others, 13%).

rowth trends

long-term trend (1978-79 to projected 1985-86): -0.5% pa

short-term trend (1983-84 to projected 1985-86): +7.1% pa

ecent developments

An important structural change in the organisation of the Department of Primary Industry has been the formation of the Australian Agricultural Health and Quarantine Service (AAHQS). The AAHQS subsumes the activities of the former Bureau of Animal Health (BAH), of the Quarantine Service (until the end of 1984 with the Department of Health), and the Commonwealth responsibilities for the Plague Locust Commission. It is likely that the pooling and coordination of resources brought about by the new organisation will also upgrade the current R&D activities in this important sector of animal production, plant agriculture and conservation.

There is the continuing implementation of the National Soil Conservation Program, launched in February 1984. For 1985-86 the Commonwealth allocation is $2.75m;

The Rural Industry Research Act 1985 will upgrade the organisation, administration and funding arrangements for industry/government funded rural research. Research Councils composed of members with appropriate expertise will allocate funds. The Councils will prepare five-year research plans, and annual operational plans in consultation with their industries, and submit these to the Minister for approval. The Councils will report on achievements against plans, both to the Minister and to their relevant industry organisations. With respect to funding, the Commonwealth will, subject to the Budget and industry wishes, continue to match industry contributions up to 0.5% of the gross value of the annual product of that industry.

CSIRO and two other research organisations have joined forces to combat a major fungal disease of tropical pastures (anthracnose of the legume stylosanthes). The Division of Tropical Crops and Pastures is developing a joint approach to the problem with the University of Queensland and Queensland Department of Primary Industries. A research team is being assembled for a five-year project.

CSIRO (Divisions of Soils, Plant Industry and Tropical Crops and Pastures) is mounting a research program into heavy clay soils that extend over very large tracts of land in New South Wales and Queensland. The aim is to provide a basis for long-term soil management and increased crop production. The first stage involves the cotton-growing soils in the Namoi region.

The Division of Entomology and the New South Wales Department of Agriculture have completed a large-scale trial in which fruit moths were controlled by use of a man-made copy of their own sex pheromone. The oriental fruit moth can cause major damage to peach orchards in SA. By flooding the air in the orchard with synthetic pheromone, the males become confused and cannot find the females. The population of moths is therefore controlled and the damage caused to trees reduced. The Queensland company, Biocontrol Ltd, is going international with this product. Each pheromone tube has the same sexual attraction for the male moth as 20,000 virgin females. At 12¢ per tube, there is a great demand for ISOMATE-M in the United States.

- Grapevine viruses can mean major losses for growers, but CSIRO scientists with the Division of Horticultural Research have discovered a way to produce virus-free vines from infected plants. The technique involves excising the growing tip of the vine shoot and growing it in an artificial culture. A range of grapevine cultivars are now held in quarantine because of the range of viruses infecting them. The discovery will help make these vines available to Australian growers and its wider application throughout the industry could see extensive plantings of virus-free vines.

- The CSIRO Division of Animal Health has developed a strategic drenching program for sheep designed to assist in the prevention of worm resistance. The program, Wormkill, involves a dramatic reduction in the frequency of drenching, but ensures maximum efficiency. It is designed to produce 'clean' pastures without the need for rotational grazing or spelling of paddocks. Wormkill, which completed its first year of commercial testing in northern NSW in 1985, was adopted by 75% of producers in the region.

- Scientists from CSIRO's Division of Tropical Animal Science have carried out the world's first successful experimental vaccination of cattle against the cattle tick. The vaccine comprises antigens from the tick's gut. Antibodies ingested with the blood of vaccinated cattle destroy the gut lining, so killing the ticks.

- CSIRO's Division of Textile Physics, in collaboration with the Australian Wool Testing Authority Ltd and the Australian Wool Corporation, has successfully completed the operational phase of the Trial Evaluating Additional Measurements (TEAM) project. The aim of the project is to allow processors of Australian wool to evaluate new measurements of raw wool, including staple length and position of weakness. In conjunction with this program, a device for measuring the length and strength of greasy wool staples (ATLAS) has been finalised and is now in commercial use with the Australian wool industry. The device will be manufactured by Kel Aerospace.

III.6 OTHER PRIMARY INDUSTRIES ($29.1m projected for 1985-86)

Major programs

About 77% of R&D here is accounted for by CSIRO. Programs administered by the Department of Primary Industry account for the balance.

Growth trends

- long-term trend (1978-79 to projected 1985-86): +3.9% pa

- short-term trend (1983-84 to projected 1985-86): -0.2% pa

Recent developments

- The CSIRO Division of Forest Research's Seed Centre has become a vital part of the world-wide efforts by developing countries to overcome their serious shortages of fuelwood by extensive planting campagins using Australia's eucalypts, acacias and casuarinas. The work of the Seed Centre had a unanimous favourable response and a call for continuation of the service provided. The centre is presently under threat because of falling research budgets.

- CSIRO's Division of Fisheries Research has discovered that the area known as 'Cascade Plateau', south-east of Tasmania, is not a plateau but a seamount identified as a quiescent volcano. Survey results confirmed that there is a possible fishery in the area and showed that the charts were wrong in their description of the area.

III.7 MINING ($25.0m projected for 1985-86)

Major programs

CSIRO accounts for about 72% of R&D expenditure directed towards this objective. The Bureau of Mineral Resources, Geology and Geophysics (BMR) accounts for most of the remainder.

Growth trends

- Long-term trend (1978-79 to projected 1985-86): -1.0% pa

- Short-term trend (1983-84 to projected 1985-86): +0.2% pa

Recent developments

- CSIRO has opened new laboratories in Brisbane and Perth to further improve its contacts with the mineral and energy industries.

- A pilot commercial scheme, SIROTOPE, has been established by CSIRO to aid exploration activities in the mineral industry. The aims are:

  - to transfer the results of research on the use of lead isotopes in distinguishing prospective from barren exploration areas, and

  - to establish the demand for a future private sector commercial service.

- BMR commenced a major collaborative study with industry and university scientists into the controls on location of gold in Australia's richest province, the Eastern Goldfields of Western Australia. The study is looking at the various factors that govern the transportation and deposition of gold in the Kalgoorlie region. It is hoped that the knowledge derived from this work will enable scientists to better understand other Australian gold provinces and assist industry in its exploration for this precious metal.

- BMR aircraft flew a record 210 000 kilometres of airborne magnetic and radiometric surveys in 1984-85. 95 percent of the survey of Tasmania was completed during the year and work started on the Pilbara Region of Western Australia to complete the coverage of the northwest of the continent, the largest area still to be flown. The BMR airborne data provide an important basis for assessment of mineral potential and for the planning of the more detailed surveys required for exploration and prospecting.

III.8 MANUFACTURING ($142.1m projected for 1985-86)

Major programs

For R&D expenditure reported for this objective, the Australian Industrial Research and Development Incentives Scheme accounts for 29% (Project Grants 27% and Commencement Grants 12%). CSIRO, accounts for 53%, other DITAC grants (see A.16.1) for 5% and AAEC (see A.20.2) for 2%.

Growth trends

- long-term trend 1978-79 to projected 1985-86): +1.0% pa;

- short-term trend (1983-84 to projected 1985-86): +4.7% pa

Recent developments

- IR&D Incentives

- The 150% tax deductability on R&D expenditure in manufacturing industry was approved and came into force on 1 July 1985. However, as the relevant tax payments are not due until 1986-87 there will be no revenue foregone until that year.

- Other direct and indirect incentives to the Australian manufacturing industry, such as the new Motor Vehicles and Components Development Grants Scheme (A.16.1), which has an allocation of $35m in 1985-86, are not included in the R&D expenditure reported in this Statement, as their R&D component cannot be evaluated at this stage (see also Section III.4 for manufacturing industry associated with defence production).

- National Biotechnology Program Research Grants Scheme

The Scheme, initiated in early 1984, is allocated to the socio-economic objective Manufacturing because of its expected benefits to the manufacturing industry, especially in the fields of genetic engineering, cell manipulation and culture, enzyme applications and fermentation technology. A new field of priority, recently approved for implementation as from 1986, concerns the alternative use of agricultural surpluses.

Other developments

The second stage of the ICI Australia Ltd-CSIRO joint project on zirconia manufacture is now underway, following a successful search for suitable process concepts. A pilot plant is being built in two sectors on ICI and CSIRO sites for joint operational tests.

The CSIRO Division of Food Research has devised a process using some of the water-soluble proteins usually lost in whey to make hard cheeses such as Cheddar. The process, which gives a high quality cheddar and about 8% increase in yield, is being commercially developed with a group of companies. The cost/benefit analysis of a case study showed that if the process was applied to 60% of Australia's hard cheese production, the yield increase would be worth $5 million a year to the industry, with additional benefits from improved quality association with the continuous nature of the process. There is strong overseas interest in the process.

Collaborative work between CSIRO's Division of Food Research, three Australian companies and one Japanese company has led to the commercial development of a dairy biotechnology process, which enables liquid dairy products to be marketed with less added sugar, though with an acceptable level of sweetness. The lactose hydrolysis process converts the non-sweet milk sugar, lactose, to a sweet sugar. A potential benefit is that many Asians are lactose-intolerant and large new markets could be available for dairy foods without lactose.

A pulsed-arc welder, which gives precisely controlled welds of the highest quality with minimum distortion and no spatter in all positions, has been developed jointly by the CSIRO Division of Manufacturing Technology and Welding Industries of Australia from a prototype developed in the Division. This welder, the Synchro-Pulse CDT, has found wide acceptance in industry and with operators because its unique control system allows easy and reproducable application of weld metal in all circumstances. It is particularly suitable for robotic welding of a wide range of ferrous and non-ferrous metals from heavy sections to very thin sheet. It is now a proven market success in Australia and overseas markets are currently being developed.

A new strain analysis system developed by the CSIRO Division of Manufacturing Technology is showing promise as a practical aid in streamlining die design and testing operations in metal press shops. SIROSTRAIN has proved to be a most useful tool serving as an indicator of the effects of changes in press settings, lubrication practice, material properties and die wear in the manufacture of large, flat car panels. Providing accurate analysis records, the system also helps reduce production costs in other ways, for example, by speeding up fault-finding procedures and correctly reworking press tools during die maintenance periods.

SCRIMBER, a timber product invented by CSIRO's Division of Chemical and Wood Technology made from pine thinnings and small trees, is about to be launched on the Australian market. The product, which was developed in collaboration with Repco, will be manufactured by the South Australian Timber Corporation. The process makes strong, structural-quality timber out of small-diameter logs which can either be plantation-grown over seven to ten years, or obtained as thinnings from normal forestry operations. SCRIMBER uses more than 85% of the log compared with current sawmilling techniques which use about 40% and the new product has a wide range of building applications.

Techniques for the manufacture of high precision antenna panels, developed by the CSIRO Division of Radiophysics, were transferred to Johns Perry of South Australia and Evans Deakin Industries of Queensland. Construction of large antennas for use in telecommunications and radio astronomy is a new venture for both these companies, in a market which will expand rapidly with the growing use of satellite communications.

- CSIRO has commenced a program to develop technology for the manufacture of the new neodymium iron boride magnets. These new magnets have a greater strength than any previously known magnet and are expected to have many applications in the manufacture of electric motors of various types, loudspeakers, and electronic components.

III.9 CONSTRUCTION ($11.9m projected for 1985-86)

Major programs

CSIRO accounts for about 73% of R&D expenditure under this heading. Elements of the Department of Housing and Construction (Central Investigation and Research Laboratory, National Building Technology Centre, etc account for the balance.

Growth trends

- Long-term trend (1976-79 to projected 1985-86): -3.4% pa;
- Short-term trend (1983-84 to projected 1985-86): +13.9% pa

Recent Developments

- Examination of aggregate for road bases and for concrete has shown that structures can deteriorate in service because of swelling on a microscopic scale of certain secondary clay minerals. X-ray diffraction studies by CSIRO have identified these clays as smectites and enabled their presence to be quantified. In the case of certain microgranite being considered for the construction of a concrete gravity dam on the Burdekin River in Queensland, the smectite content has been shown to correlate to the extent of absorption of a specific dye as well as to the micro-measurement of dimensional stability. The dye absorption has been applied in the field to allow the more stable aggregate to be selected from percussion drilled samples at the quarry close to the dam site, thus enabling its exploitation with considerable savings in aggregate transport costs.
- Investigation of the degradation of polyvinylchloride (PVC) when subjected to combustion has shown that promotion of char reactions renders the component more stable. In the case of pipes to be used within building structures, devices have been developed by CSIRO and commercialised by industry to stop the spread of fire through holes in fire-rated walls and floors through which the pipe services must penetrate. The devices contain intumescent layers that squeeze the PVC pipe as it softens restricting air supply and promoting char formations. The char and the device are sufficiently stable for the system to achieve a 4 hour fire rating. Regulatory building authorities have accepted the device which dispenses with costly construction of fire-rated shafts for such pipes. Other similar studies on the PVC pipes indicate that they may be designed to provide low cost sprinkler systems for residences and extra low hazard occupancies.

III.10 ENERGY ($64.7m projected for 1985-86)

Major programs

CSIRO accounts for 42% of the research expenditure on energy, but other major activities are supported by AAEC (21%), the National Energy Research Development and Demonstration Program (19%) and BMR (18%).

rowth trends

Long-term trend (1978-79 to projected 1985-86): +3.6% pa;

Short-term trends (1983-84 to projected 1985-86): -7.2% pa

ecent developments

Oil and Gas Exploration

BMR commenced a new marine research program to study the geological and structural framework and resource potential of Australia's vast continental margin. This huge area of almost 12 million square kilometres (one-and-a-half times larger than onshore Australia) is believed to contain most of our undiscovered petroleum. The study will thus be an important part of continuing efforts to maintain the highest levels of oil self-sufficiency well into the next century. The work entails the collection of regional geological and geophysical data, over areas which are not currently being actively explored by industry and over areas of deeper water which may be the next phase of exploration. The data are being processed, interpreted, synthesised and publicly released by BMR, with a view to promoting and stimulating exploration.

During the course of a project to evaluate the petroleum potential of some of Australia's older sedimentary basins, BMR scientists discovered 'live oil' in the McArthur Basin, Northern Territory. The oil, which is about 1500 million years old, is probably the oldest oil show yet discovered in the world, and represents tangible evidence that basins of this great age have petroleum potential.

Coal

Recent improvements to the SIROTEM prospecting instrument, developed by CSIRO for detecting base-metal orebodies, now enable its use in exploration for coal and oil shale deposits and groundwater.

I.11 TRANSPORT ($2.6m projected for 1985-86)

ajor programs

D activities contributing to this objective include support for the Australian Road esearch Board (25%), Department of Aviation programs (44%) and the Office of Road Safety 7%), the balance being represented by other activities of the Department of Transport .25.1 and 2).

owth trends

Long-term trend (1978-79 to projected 1985-86): -15.5% pa

Short-term trend (1978-79 to projected 1985-86): -19.7% pa

III.12 COMMUNICATIONS ($59.7m projected for 1985-86)

Major programs

The R&D activities of Telecom (89%) account for almost all this objective. An important contribution is also given by the Overseas Telecommunications Commission (8%). Worth noting that 99.4% of the R&D funds in this sector derive from profits made by Commonwealth owned Business Enterprises.

Growth trends

- Long-term trend (1978-79 to projected 1985-86): +1.3% pa;

- Short-term trend (1978-79 to projected 1985-86): +9.4% pa

Recent developments

R&D towards Communication objectives is steadily increasing in Australia, with particular emphasis on satellite technology and optical fibres cables. A list of recent achievements and future objectives is given in Appendix A.7, especially at Section A.7.5 and A.7.6.

Expertise in antenna design developed for the Australia telescope project enabled OTC to place orders for its new generation of ground station antennas with Australian design and manufacturing firms (MacDonald Wagner and Johns Perry). In a related development, OTC's R&D program has led to the establishment of an industry/CSIRO/university consortium to produce a prototype earth station facility for the INTELSAT business services network.

III.13 ECONOMIC SERVICES ($35.5m projected for 1985-86)

Major Programs

CSIRO provides 61% of R&D expenditure under this heading. Other supporting agencies include the Reserve Bank (19%), Australian Bureau of Statistics (12%), Bureau of Industry Economics (7%), and Bureau of Labour Market Research (6%).

Growth trends

- Long-term trend (1978-79 to projected 1985-86): +5.1% pa;

- Short-term trend (1983-84 to projected 1985-86): +18.5% pa

Recent developments

. Information Technology

- A new analytical tool developed by the CSIRO Division of Water and Land Resources will allow political parties to tailor their campagins to individual neighbourhoods. In conjunction with the Australian Electoral Office and Australian Survey Office, the Division has developed a computerised mapping method which merges voting data for individual polling booths with census data for surrounding areas.

- CSIRO Division of Radiophysics has decided to establish a facility for producing gallium arsenide wafers and for fabrication of a range of active microwave devices for communications and satellite systems. Gallium arsenide is a semiconductor material better suited to high speed and high frequency devices than the more common silicon technology. Commercial participation in this early stage of development is being encouraged and a strong interest by private industry is already evident.

- A centre for collaborative research on knowledge-based systems for computer-aided design (CAD) was established earlier this year (1985) in the Division of Building Research, CSIRO. The centre was developed in collaboration with ACADS (Association for Computer-Aided Design) and the Victorian Government - with support from the CSIRO information technology program and the CAD and computer industries. The research is an extension of previous divisional contributions to computer-aided design and planning and is focussed at three levels:

  (1) development of generic techniques for CAD including:

    (a) intelligent optimization techniques as 'engines' for driving computer-aided design and automated techniques, and

    (b) expert system shells and graphic interfaces;

  (2) application of these techniques to planning, design and management at the levels of urban engineering and service systems, facilities for production of goods and services, and information systems for local government;

  (3) collaboration with the CAD and computer industry on further development and wider application of the generic techniques.

- The CSIRO Division of Information Technology, established in January 1985, is now in the process of securing laboratory accommodation and a complement of resident staff in Sydney and Melbourne where it is planned to work from 1986 onwards in collaboration with academic and private sector interests in the following aspects of information technology:

  - the demonstration and enhancement of 'open systems interconnection' components,

  - the exercise of local and wide area networks that subscribe to the emerging international standards,

  - the demonstration of the design and device development capability available for prototype microelectronic systems,

  - the provision of a focus for the disciplines of testing the reliability of software and improving the formal specification of software,

  - the use of software and hardware to ease and improve the introduction of novel or complex information technology components in the mass market.

II.14 URBAN AND REGIONAL DEVELOPMENT ($2.7m projected for 1985-86)

ajor programs

SIRO accounts for about 87% of R&D expenditure under this heading. The Department of erritories and ABS cover the remainder.

Growth trends

- Long-term trend (1978-79 to projected 1985-86): +1.4% pa;

- Short-term trend (1983-84 to projected 1985-86): -3.5% pa

Recent Developments

CSIRO (Division of Water and Land Resources) has been studying the ecology and management of military training areas for the Defence Department for some years. A recent conclusion from analyses of the data is that many of the training areas actually encourage wildlife rather than destroy it. Some rare species of birds and plants thrive because the areas exclude farming and forestry pursuits as well as the public.

III.15 ENVIRONMENT ($35.2m projected for 1985-86)

Major programs

Two thirds of the activites directed to this objective are conducted by CSIRO. Other agencies incude the Office of the Supervising Scientist for the Alligators Rivers Region (18%), and AAEC (11%). The balance is given by activities under the Arts, Heritage and Environment Portfolio.

Growth Trends

- Long-term trend (1978-79 to projected 1985-86): +2.2% pa;

- Short-term trend (1983-84 to projected 1985-86): -0.3% pa

Recent developments

- Controversy has surrounded the possible impact of forest industries on fauna in the coastal forests of New South Wales. Research by the CSIRO Division of Wildlife and Rangelands Research has now advanced to a stage where guidelines can be made available to forest managers that take into account the habitat requirements of free-dwelling marsupials.

- Recent work by CSIRO's Division of Environmental Mechanics in collaboration with the University of Melbourne has shown that much of the theory of infiltration (process by which water enters the soil and moves through the soil profile) can be recast into a formulation strictly analogous to the scattering of electromagnetic radiation. This immediately makes available a powerful armoury of mathematical methods and results for predicting water flow in practical situations, especially drip and row irrigation. Based on this work, a new technique for rapidly measuring the hydraulic conductivity of the soil (a frequently used factor in engineering hydraulics) has been developed.

III.16 HEALTH ($92.8m projected for 1985-86)

Major programs

The National Health and Medical Research Council grants program (56%) provides the major support for health R&D. Various elements of the Department of Health provide 27% of support, while the Commonwealth Serum Laboratories (7%), CSIRO (6%) and AAEC (4%) also contribute to this objective.

Growth trends

- Long-term trend (1978-79 to projected 1985-86): +10.2% pa;

- Short-term trend (1983-84 to projected 1985-86): +11.5% pa

ecent developments

CSIRO's Division of Human Nutrition was invited by the United Nations Agencies' Administrative Committee on Coordination - Subcommittee on Nutrition, through the Australian Department of Health, to prepare a strategy for Global Eradication of Iodine Deficiency Disorder. A plan of action was formulated and an International Council for the Control of Iodine Deficiency Disorders established. It is estimated that some 400 million people are at risk of Iodine Deficiency Disorder in Asia.

The CSIRO Division of Human Nutrition has collected data for the first six years of a ten year study of birthrates and early child development in the Port Pirie, SA, area in conjunction with the SA Health Commission and the Adelaide Children's Hospital. Analysis of the pregnancy phase of the study has shown that increased concentrations of maternal blood lead in mid-pregnancy are associated with an increased risk of premature delivery.

The molecular structure of a protein which coats the influenza virus and is responsible for triggering the human immune system, has been unravelled by CSIRO's Division of Protein Chemistry and Australian National University scientists. This detailed 3-D structure of the neuraminidase protein has revealed the chemical changes associated with antigenic variation in this virus, and has allowed the highly concerned structure of the enzyme active site to be recognised. This has opened up completely new research, in collaboration with the Victorian Pharmacy College, on the design of specific drugs to block influenza virus.

As a spin-off from studies of the fundamental properties of diamonds and accumulated expertise in diamond technology, the Division of Chemical Physics has been able to overcome the difficulties associated with the sharpening of diamond surgical scalpels as used by local opthalmologists. Previously these scalpels had to be sent back to the overseas manufacturers for re-sharpening and there were problems with return times of some three months, possible damage during transit, etc. However, the Division of Chemical Physics now provides a fast, local high-quality, re-sharpening service to the surgeons. It is anticipated that user feedback to the Division will lead to further developments and refinement of technique~~s~~ plus a greater understanding of diamonds in general.

II.17 EDUCATION ($3.9m projected for 1985-86)

ajor programs

variety of programs undertaken within the Department of Education contribute a large art (39%) of R&D directed to understanding, improving or evaluating the education rocess. (Note that Commonwealth Tertiary Education Commission funds for research in the ertiary education sector, and post-graduate awards, are classed as being directed towards general advancement of knowledge'.) Research on curriculum development, now under the egis of the Commonwealth Schools Commission, makes up the bulk of the remaining R&D into ducational matters (44%). ABS, the Department of Immigration and Ethnic Affairs, and a mall contribution of the Department of Foreign Affairs account for the remainder.

rowth trends

Long-term trend (1978-79 to projected 1985-86): -8.3% pa;

Short-term trend (1983-84 to projected 1985-86): +6.9% pa

III.18 WELFARE ($3.6m projected for 1985-86)

Major programs

Major elements include the Departments of Community Services (32%), Social Security (18%) Immigration and Ethnic Affairs (8%), and the Australian Bureau of Statistics (41%).

Growth trends

- Long-term trend (1978-79 to projected 1985-86): +8.5% pa;
- Short-term trend (1983-84 to projected 1985-86): +27.8% pa

III.19 OVERSEAS DEVELOPMENT ASSISTANCE ($37.2m projected for 1985-86)

Major programs

About 73% of R&D support under this heading is provided by the Australian Development Assistance Bureau. The balance is mostly provided by the Australian Centre for International Agricultural Research.

Growth trends

- Long-term trend (1978-79 to projected 1985-86): +11.8% pa;
- Short-term trend (1983-84 to projected 1985-86): +7.3% pa

Recent developments

Animal Husbandry, Plant Production, Service Engineering, Community Health and Advanced Training are the main topics of R&D assistance to Development Countries. Most of the hel (see also Sections A.12.2 and 3) is directed to the SE Asia-Pacific region.

III.20 OTHER COMMUNITY SERVICES ($7.9m projected for 1985-86)

Major programs

The R&D supported by the Law Reform Commission (about 41%), the Human Rights Commission (20%) and the Australian Institute of Criminology (10%) constitute most of the activities for this objective. Other Ministries involved are: Aboriginal Affairs, Arts, Heritage and Environment, Attorney-General's, Special Minister of State, and also ABS and NCDC.

Growth trends

- Long-term trend (1978-79 to projected 1985-86): +11.5% pa;
- Short term trend (1983-84 to projected 1985-86): +13.1% pa

III.21 EARTH, OCEAN and ATMOSPHERE ($66.6m projected for 1985-86)

Major programs

R&D activities towards this objective are undertaken or supported by CSIRO (28%); the Antarctic Division of the Department of Science (34%), the Australian Institute of Marine Science (12%); BMR (13%); the marine science grants and fellowships programs (5%); the Bureau of Meteorology (4%); minor contributions are given by the Water Division of the Department of Resources and Energy, AAEC and the Department of Territories.

Growth Trends

- Long-term trend (1978-79 to projected 1985-86): +4.5% pa;

- Short-term trend (1983-84 to projected 1985-86): -6.6% pa

Recent developments

. Earth Sciences

- The CSIRO Division of Water and Land Resources, in collaboration with the Australian Atomic Energy Commission, has used radio-active caesium deposited during atmospheric testing of nuclear devices in the Northern Hemisphere to measure soil erosion rates in Australia. This is an unexpected technique which has a higher degree of accuracy than the usual methods.

- In addition to the major marine geoscience program referred to under the energy objective, BMR is also undertaking an expanded program of research into the Geology of the Australian continent. A major study of the deep structure of the continent by seismic reflection techniques has begun, and will be complemented by detailed studies of Australia's major sedimentary basins and mineral provinces. These programs will be supported by BMR's new Seismic Processing Centre which is now fully operational.

- As a result of a Government initiative, BMR is establishing an independent national monitoring capability to provide Australia with information on underground nuclear explosions, and an international data centre to transmit and process seismological data. The initiative is an important element in achieving the Government's objective of seeking a Comprehensive Test Ban Treaty. During 1984, BMR both co-ordinated and participated in a world-wide technical experiment which demonstrated the feasibility of an international exchange of seismic data for detecting and identifying nuclear test explosions under such a Treaty.

. Oceanography

- Australia's first purpose-designed civilian deep-sea oceanographic research vessel, the *R.V. Franklin*, was commissioned in April 1985. Comprehensively equipped with laboratories and the most modern oceanographic instrumentation, *Franklin* is operated by the CSIRO Division of Oceanography as a national facility to serve the needs of Australia in physical, chemical and biological oceanography. As a national facility, *Franklin* is available to oceanographers from all Australian marine science institutions, with ship time being allocated by an independent steering committee.

- Research has been undertaken in CSIRO on the numerical modelling of tides and currents around Australia. This work has already yielded a model for the Leeuwin current; the extension of current models of coastal and continental tides to include longshore topographic variations; and numerical results for surface waves forced by a wind field.

. Space Applications and Remote Sensing

- At the CSIRO Division of Oceanography in Hobart, the facility for tracking, processing and manipulation of high resolution infrared sea surface images from NOAA satellites has reached operational status. The system will be used in support of oceanographic research programs, and to assist the deployment of the research vessel Franklin relative to oceanographic surface features through transmission to the vessel of full-colour satellite images. The satellite tracking system will be developed also to receive NIMBUS Coastal Zone Colour Scanner Data, and Search and Rescue Satellite (SARSAT) data. A database of NOAA imagery for Australian oceanographic research will be developed.

- Space science and technology has been designated as a growth area for CSIRO in 1985/86. The CSIRO Office of Space Science and Applications is developing a coordinated space research and develop program designed to enhance the Organization's expertise in areas offering significant industrial opportunities. Major activities across CSIRO include:

    - design of antenna for commercial production of communications satellite earth stations,

    - development with industry of meteorological satellite data reception and image handling systems for domestic and export markets,

    - participation, with UK, in along track scanning radiometer scientific development program for European remote sensing satellite to be flown in 1989,

    - collaboration with NASA in use and development of advanced remote sensing scanners for shuttle flights in late 1980s,

    - collaboration with Australian Landsat Station in providing experimental reception of thematic mapper data in 1986,

    - pre-feasibility study of CSIRO/industry/university collaboration in building small scientific satellite for flight in 1988.

- The application of Remote Sensing techniques to R&D in the fields of the Earth Science and Oceanography has been further extended and increased. All organisations mentioned at the beginning of this section make large use of remote sensing. As an example, the Great Barrier Reef Marine Park Authority is currently co-funding the development of spectral signatures for reef features.

- Atmosphere and Climate

- The CSIRO Division of Atmospheric Research has developed a satellite data reception and handling system which consolidates the vast quantities of data transmitted from earth resources and weather satellites into manageable quantities of real-time data with a very high information content. The system uses receiving hardware which can obtain the highest resolution weather satellite data, computing hardware of sufficient power to handle the data at the enormous rates required for real-time analysis, and display hardware which enables an operator to visualise scenes and images on colour TV monitors. The complete system is known as CSIDA, the CSIRO System for Interactive Data Analysis and is now commercially available through a joint venture between the Division and two Australian companies, PCM Electronics which provides the satellite tracking and data receiving equipment, and Dindima Pty Ltd which provides the data processing and display hardware and software. The two companies provide a complete turn-key system for about one-fith the cost of comparable systems.

- The establishment of a new Bureau of Meteorology Research Centre and of the National Climate Centre (NCC) within the Bureau of Meteorology has provided a focus for the provision of climate data and information. As a consequence, the R&D activities of the Bureau have almost doubled in the last two years (see also Section A.21.2).

III.22 GENERAL ADVANCEMENT OF KNOWLEDGE ($211.1m projected for 1985-86)

Major programs

R&D activities under this heading are supported through grants to universities (61%), the Australian Research Grants Scheme (12%), Commonwealth Postgraduate Research Awards (8%), Commonwealth Special Research Centres (3%), CSIRO (11%), AAEC (4%) and Anglo-Australian Telescope Board (1%).

Growth trends

- Long-term growth (1978-79 to projected 1985-86): +3.5% pa;

- Short-term growth (1983-84 to projected 1985-86): +1.7% pa

Recent developments

Details of new developments and achievements are included in Sections A.44, A.10.2, A.20.2, A.21.1, 2, 3 and 4.

CHAPTER IV

INTERNATIONAL COMPARISONS AND TRENDS(1)

IV.1 Total resources devoted to R&D

Figure 5 and Table 12 (overpage) show the source of funds and sector of performance of R&D expenditure of OECD member countries for the latest year for which data are available, grouped according to gross expenditure on R&D (GERD). The figure shows that all the large R&D performing OECD countries are also highly R&D intensive and perform the greater part of their R&D in the business enterprise sector. Of those countries for which recent estimates are available only New Zealand, Portugal and Iceland had higher proportions of government performance and funding of R&D than Australia. Another feature of particular note is the very low proportion of funds provided for R&D by business enterprise in Australia. Figure 5 indicates that only in New Zealand, Portugal and Iceland does the business enterprise sector contribute a lower proportion of GERD as a percentage of GDP.

In comparing GERD as a percentage of GDP among OECD countries, Australia's position prior to 1973 was close to the median, but between 1973 and 1976 our position deteriorated. This was a result of a sharp decline in business enterprise sector R&D in Australia, a decline in strong contrast with the stabilisation or increase in privately funded business enterprise R&D which occurred over the years prior to 1976 in almost all other OECD countries. Subsequent survey information indicates that while the decline in Australian private business enterprise R&D growth had been arrested by 1978-79 (2), there has been no significant recovery. Private business enterprise R&D funding declined by 3% in real terms between 1978-79 and 1981-82. These trends are shown at the foot of Table 12.

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(1) International comparisons are subject to a number of caveats arising from differences in R&D survey practice in the various countries. The proposed standard OECD practice is set out in the "Frascati Manual": The Measurement of Scientific and Technical Activities, OECD Paris 1980, but most member countries differ from the proposed standard in some areas. Readers should refer to the publications of the OECD Science and Technology Indicators Unit for details. Source documents for this section were:

- Recent Results - Selected S&T Indicators 1979-1984,Paris, December 1984
- OECD Science and Technology Indicators, Resources Devoted to R&D, OECD, Paris 1984
- Science Resources Newsletter, No 7, Summer 1983

(2) Research and Experimental Development - Business Enterprises, Australia - 1981-82, Australian Bureau of Statistics Catalogue No 8104.0, 1 March 1984, and No 8114.0, 7 June 1985.

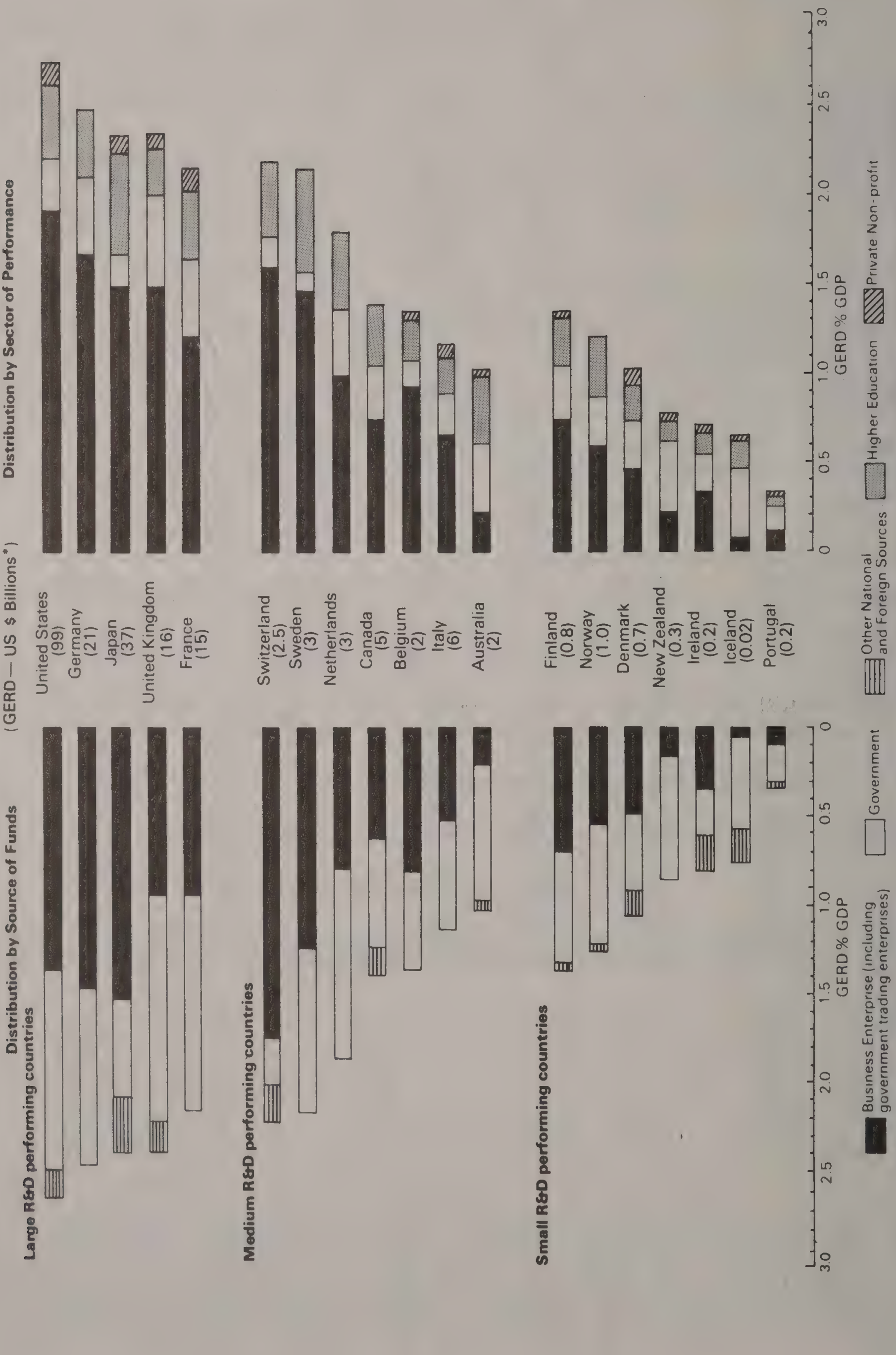
able 12: Comparisons between OECD nations - R&D employment as % Total Workforce and gross domestic expenditure on R&D (GERD) as % GDP (latest available year)

untry	R&D Employment as % total workforce	% GERD/ GDP	R&D in Sector* as % GDP					
			Source of Funds*			Performance*		
			Business Enterpr.	Government Civil	Defence	Business Enterprise	Government	Higher Education
arge R&D Performers								
.S.A. (1984)	1.27	2.74	1.35	0.42	0.81	1.99	0.31	0.36
.R. Germany (1983)	1.36	2.57	1.46	1.00	0.11	1.79	0.36	0.41
Group Median)	1.17	2.47	1.35	0.70	0.46	1.53	0.36	0.36
apan (1982)	1.16	2.47	1.50	0.63	0.01	1.53	0.25	0.58
.K. (1981)	1.17	2.46	0.93	0.70	0.68	1.52	0.53	0.33
rance (1984)	1.07	2.19	0.91	0.84	0.44	1.24	0.47	0.34
edium R&D Performers								
witzerland (1981)	1.23	2.29	1.72	0.26	0.04	1.70	0.14	0.45
weden (1981)	1.00	2.23	1.26	0.76	0.21	1.49	0.14	0.60
etherlands (1984)	1.01	1.87	0.86	0.96	0.03	1.02	0.38	0.44
Group Median, xcluding Australia)	0.89	1.65	0.89	0.63	0.04	0.98	0.20	0.33
anada (1983)	0.55	1.42	0.60	0.65	0.04	0.73	0.35	0.34
elgium (1979)	0.78	1.40	0.91	0.49	..	0.97	0.13	0.29
taly (1984)	0.46	1.19	0.54	0.60	0.05	0.64	0.26	0.19
USTRALIA (1981)	0.65	1.01	0.21	0.70	0.07	0.23	0.47	0.30
mall R&D Performers								
inland (1983)	0.79	1.37	0.72	0.62	0.01	0.78	0.21	0.29
orway (1981)	0.75	1.28	0.49	0.70	0.07	0.67	0.24	0.37
ustria (1981)	0.56	1.16	0.59	0.51	..	0.65	0.07	0.38
enmark (1981)	0.57	1.07	0.47	0.50	..	0.54	0.21	0.25
Group Median)	0.60	0.89	0.26	0.50		0.27	0.28	0.19
ew Zealand (1979)	0.62	0.88	0.14	0.73	0.01	0.18	0.53	0.15
reland (1982)	0.42	0.79	0.27	0.38	..	0.34	0.30	0.13
celand (1981)	0.69	0.75	0.04	0.57	..	0.07	0.46	0.20
ortugal (1980)	0.18	0.33	0.08	0.22		0.09	0.15	0.07
ustralian Trends								
ustralia (1968-69)	0.80	1.34	0.48	0.79		0.49	0.53	0.32
ustralia (1973-74)	0.85	1.26	0.42	0.79		0.42	0.50	0.33
ustralia (1976-77)	0.70	1.05	0.24	0.78		0.24	0.50	0.29
ustralia (1978-79)	0.68	1.03	0.21	0.79		0.24	0.46	0.32
ustralia (1981-82)	0.65	0.98	0.21	0.73		0.23	0.44**	0.30
ustralia (est 83-84)	na	0.95	0.20	0.72		0.22	0.41	0.30

In OECD data the Business Enterprise sector includes both private and public business enterprises. The General Government sector includes federal and provincial or State governments and their agencies excluding public business enterprises. "Government" as a source of funds includes the "Own funds" of public universities. Note that there are sectors other than those shown, so that the totals are less than the % GERD/GDP.

** The figures are adjusted for trend comparison purposes (to remove the effect of changed superannuation arrangements and the additional pay period in 1981-82 for Commonwealth bodies). For unadjusted figures (more appropriate for international comparisons) see under "Medium R&D performers"

Fig. 5 R & D Expenditures by Country — latest available year.



GERD — Gross domestic expenditure on R&D * At purchasing power parity — not current exchange rate **Estimated for 1984 by Department of Science**

.2 Government R&D funding for R&D socio-economic objectives

Table 13 shows for twelve countries the distribution of Government funds to R&D
n selected OECD socio-economic objective categories. The funding levels are expressed as
arts per 10 000 of GDP. By comparison with the median values for countries other than
istralia and for which data are available, it can be seen that Australian Government
inding in 1980-81 was high for agriculture (4 1/2 times the median), and environment
3 times); close to the median for industrial growth, advancement of knowledge, and
efence; and low for energy, health, and social development and services (all less than
alf of the respective median values).

These comparisons need to be taken with some reservation, as the data are only
coadly comparable between countries. In particular all general university funds devoted
R&D have been included under advancement of knowledge. Thus, in Australia for example,
considerable amount of medical R&D is included in advancement of knowledge, thereby
onsiderably understating the total Government support for the health objective.
oreover, each country has its own spectrum of needs which is reflected in differing
unding priorities. The observed differences must therefore be interpreted in the context
additional information about the countries concerned.

Table 13: Government R&D funding by OECD socio-economic objectives*, (1982 or nearest year)

(Cents expended per $100 of gross domestic product)

Country	Agr.	Ind.	Energy	Env.	Health	Soc.	A. of K.	Def.	Other
F.R. Germany	2.4	14.4	19.5	2.2	5.0	4.8	49.2	10.9	8.2
U.S.A.	2.5	0.4	18.9	0.7	12.3	1.4	n.a.	81.2	20.8
U.K.	5.3	9.5	8.4	1.4	1.6	1.5	32.0	68.2	4.9
France	5.2	16.6	9.4	1.3	5.9	1.6	31.3	45.8	15.2
Netherlands	7.0	9.7	4.2	.	3.9	4.4	49.0	3.1	11.8
Sweden	2.5	5.6	12.9	2.1	8.8	9.4	47.7	28.8	11.0
Belgium	2.9	10.7	6.0	2.0	9.4	7.2	19.1	0.1	3.1
Canada	11.8	7.8	8.6	0.8	4.2	3.3	12.6	3.9	6.0
Australia	15.5	8.4	3.3	1.8	3.0	2.3	29.2	6.9	3.7
Italy	1.9	8.6	13.9	1.2	1.8	0.9	25.8	6.4	4.5
Norway	7.8	10.8	3.7	2.7	3.7	6.1	32.2	7.4	5.8
Finland	7.1	13.8	3.5	0.5	0.8	4.7	24.5	1.0	5.8
Denmark	4.2	7.9	5.3	0.8	4.5	3.5	16.3	0.1	4.4
New Zealand	24.5	9.2	5.6	-	4.6	3.0	11.3	0.4	15.4
Median (excl. Aust.)	4.2	9.7	8.9	1.4	4.5	4.4	31.7	7.4	5.8

* OECD socio-economic objectives

Agr.: Agriculture, Forestry, Fishing
Ind.: Industrial Growth (includes manufacturing, mining, construction and economic services)
Energy: Production of Energy
Env.: Environment Protection
Other: Includes
Transport and Telecommunications
Urban and Rural Planning
Not Specified
Earth and Atmosphere
Civil Space

Health: Health
Soc.: Social Development Services
A. of K.: Advancement of Knowledge
Def: Defence

Note:

These data are subject to a number of qualifications for which the original source should be consulted. In addition, some categories for a number of countries contain S&T (other than R&D) categories as well as R&D, as they are based on "science budgets" or similar analyses for the countries concerned. Some R&D outside the science budgets may be omitted.

Another important point is that all general funding of universities (other than special purpose granting schemes) is allocated to "Advancement of Knowledge". Thus, for example, Advancement of Knowledge for Australia contains a large component directed towards the Health objective (which would rise to about 7.6 if this component was included) and a further amount for Agriculture (which would rise to over 20). For federal systems such as Australia, the table includes both State and Federal funds.

Source: OECD Science Resources Newsletter, No. 7 Summer 1983

.3 Technology-based export performance

Figure 6 and Table 14 give an indication in broad terms of Australia's low sition among OECD countries in relation to exports of "technology-based" products. ile all manufactured products are technology-based according to a strict definition of chnology (1), the term "technology-based" is used in this report to refer to products lling within Standard International Trade Classification divisions which include the cognised "high-technology" or "technology-intensive" product classes. The data are awn from OECD publications (2), in the Standard International Trade Classification visions 51 (organic chemicals), 52 (inorganic chemicals), 53 (dyeing, tanning and colour terials), 54 (medicinal and pharmaceutical products), 58 (artificial resins and plastic terials and cellulose esters and ethers), 59 (chemical materials and products n.e.i.), (power generating machinery and equipment), 72 (machinery specialised for particular dustries), 73 (metalworking machinery), 74 (general industrial machinery and equipment e.i. and machine parts n.e.i.), 75 (office machines and automatic data processing uipment), 76 (telecommunications and sound recording and reproducing equipment), (electrical machinery, apparatus and appliances n.e.i. and electrical parts thereof), (professional scientific and controlling instruments and apparatus n.e.i.) and (photographic apparatus, equipment and supplies, and optical goods n.e.i., watches and ocks).

Although some of the products in these product divisions would not be regarded as chnology-intensive on the usually accepted basis of above average R&D intensity in the sociated industry class, and some high technology products (eg. aircraft and associated rts) have not been included, taken overall it is thought that exports in these fifteen oduct divisions may be regarded as a reasonably satisfactory comparative measure of a untry's capability in producing technology-based products. Aircraft and parts were cluded because Australia's exports in this product class are almost entirely re-exports imported products.

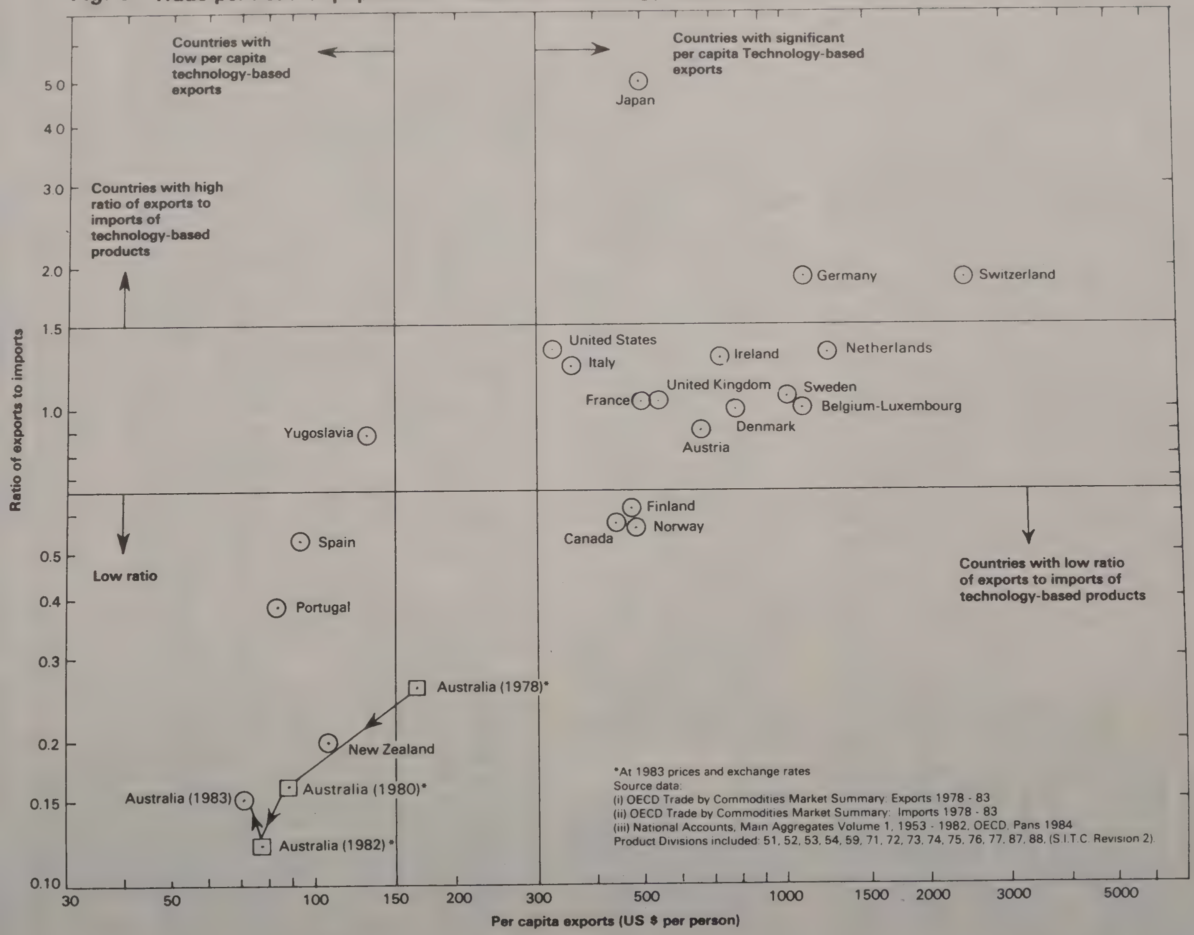
Interpretation of this indicator may differ according to the economic philosophy opted. The indigenous levels of installed technology and technical skills of the rkforce are among the economic determinants of the national product mix and mpetitiveness on the export market. In looking at trade in the technology-based product oups we are looking at the outcome of many economic factors and influences, but this per adopts the viewpoint that trade in these product groups represents demonstrated chnological capability. It may well be that countries such as Australia which are low the scale of technology-based exports have either consciously elected or through market rces come to rely on trade in other commodities in which they have comparative advantage d/or traditional involvement. However, if they are not involved in producing a chnology-based product competitive on the export market it is fair to assume that in st cases they will not be current in the state-of-the-art for that product.

Figure 6, shows that Australia's position in regard to both technology-based ports per capita and ratio of technology-based exports to imports declined from 1978 to 80, and had declined even further by 1982. There has been a small recovery on the port/import ratio indicated in 1983.

) "Technology is a perishable resource comprising knowledge, skills, and the means of using and controlling factors of production for the purpose of producing, delivering to users, and maintaining goods and services from which there is an economic and/or social demand."

) (i) OECD Trade by Commodities Market Summary: Exports 1979-83
(ii) OECD Trade by Commodities Market Summary: Imports 1979-83
(iii) National Accounts, Main Aggregates, Volume 1, 1954-1983, OECD, Paris, 1985

Fig. 6 Trade per head of population in selected technology-based products 1983



*At 1983 prices and exchange rates
Source data:
(i) OECD Trade by Commodities Market Summary: Exports 1978 - 83
(ii) OECD Trade by Commodities Market Summary: Imports 1978 - 83
(iii) National Accounts, Main Aggregates Volume 1, 1953 - 1982, OECD, Pans 1984
Product Divisions included: 51, 52, 53, 54, 59, 71, 72, 73, 74, 75, 76, 77, 87, 88, (S.I.T.C. Revision 2).

In general the countries exporting large volumes of technology-based products are o large importers. The average relationship for all 24 OECD countries suggests that orts are roughly proportional to the square root of the exports. Japan has a much her than average ratio of exports to imports in these product groups, because its orts are only about 40% of the average level corresponding to its export figure. This probably due to a high level of self sufficiency combined with difficulties experienced other countries in penetrating the Japanese market.

Table 15 presents some further indicators which correlate to some degree with the de-based ones. Patenting in the US System (for non-American countries) may be a good icator of propensity to export. For a number of countries there appears to be a broad ation between the level of trade in technology-based products (Table 14 and Figure 6), enting in the US system (Table 15) and the amount of R&D in manufacturing industry ble 13). Australia has a higher level of US-System Patenting than would be expected m its level of manufacturing R&D and comparison with other countries. However, the parisons also show a lower than expected level of technology-based exports.

Table 14: Trade in selected Technology - Based Products - OECD Nations, 1983

Country	Population (Million persons)	Exports (US $m)	Imports (US $m)	Ratio of exports to imports	Per Capita exports (US $ per person)
Large R&D Performers					
U.S.A.	234.496	97983.0	63761.9	1.25	340.2
F.R. Germany	61.421	69591.6	35725.6	1.95	1133.0
Japan	119.259	68096.1	14737.2	4.62	571.0
U.K.	56.364	32067.8	30370.8	1.06	568.9
France	54.438	30004.6	28384.7	1.06	551.2
Medium R&D Performers					
Switzerland	6.505	15784.6	8633.5	1.83	2426.5
Sweden	8.331	8832.2	8642.4	1.02	1060.2
Netherlands	14.362	18861.3	15235.2	1.24	1313.3
Canada	24.907	11177.3	21029.8	0.53	448.8
Belgium	9.860	11427.8	11402.7	1.00	1159.0
Italy	56.835	20682.2	17533.9	1.18	363.9
AUSTRALIA	15.369	1119.6	7342.7	0.15	72.8
Small R&D Performers					
Finland	43.863	2364.3	3991.6	0.59	486.2
Norway	4.130	2012.3	3885.4	0.52	487.2
Denmark	5.114	4355.5	4403.6	0.99	851.7
New Zealand	3.203	353.9	1937.4	0.18	110.5
Ireland	3.510	3461.2	2853.5	1.21	986.1
Iceland	0.237	2.8	200.8	0.01	11.6
Portugal	10.099	872.3	2325.8	0.38	86.4
Austria	7.549	5512.9	6017.7	0.92	730.3
Greece	9.850	287.9	2101.4	0.14	29.2
Spain	38.228	3551.2	7153.6	0.50	92.9
Turkey	47.750	419.1	3508.7	0.12	8.8
Yugoslavia	22.855	3047.1	3574.2	0.85	133.3

Note: The table is arranged to place the countries in the same order as Table 10.

Table 15: US patenting and the manufacturing sector - OECD nations, 1981.

Country	BERD (US $m) 1981	Manufacturing industry BERD* (US $m) 1981	Domestic product of manufacturing industry* (US $m)	Average annual US patents= (1977-1984)
Large R&D Performers				
USA	51810	49716	650954	40521
FR Germany	10686	9934	201795	5876
Japan	15517	14151	330319	8151
UK	7030	6334	92597	1989
France	6304	5838	133118	2162
Medium R&D performers				
Switzerland	1325	1298	na	1317
Sweden	1442	1249	20522	836
Netherlands	1336	1205	31305	707
Canada	1864	1450	57455	1274
Belgium	950	866	22727	276
Italy	2563	2108	129779	806
AUSTRALIA	344	211	26162	325
Small R&D performers				
Finland	273	250	10171	136
Norway	309	214	7119	97
Denmark	274	228	8211	160
New Zealand	52	47	6015	50
Ireland	68	57	3603	25
Iceland	2	2	na	1
Portugal	48	34	11862	5
Austria	427	392	17758	286
Greece	23	16	8602	12
Spain	443	370	54866	79
Turkey	na	na	29598	2
Yugoslavia	294	na	20001	12

Notes: The table is arranged to place the countries in the same order as Table 1.

* Some figures are estimates based on data for years prior to 1981.
= Patents taken out in the US having one or more inventors domiciled in the nation shown.

Sources:

BERD and the manufacturing sector data were derived from OECD publications. US patenting data were derived through on-line access to the USPA and USP77 data bases mounted on the System Development Corporation's ORBIT system.

APPENDIX A

MINISTRY ACTIVITIES

A.1 PRESENTATION

s Appendix is a presentation of Commonwealth R&D and S&T expenditures by ministry. ders are reminded that the S&T figures include the R&D expenditures, and that the pose of the S&T figures is to identify programs and agency units primarily devoted to activities. (See Appendix D for definitions and further details).

tables for the ministries are presented in three categories (not all the categories ly for particular ministries), Commonwealth Budget sector net expenditure, monwealth Non-Budget sector, and expenditure from other sources. Figures listed under monwealth Budget sector net expenditure correspond to expenditure on S&T from amounts ropriated by Parliament under the Appropriation Acts, less any relevant recoveries or ome received by the Commonwealth in respect of particular activities. Commonwealth -Budget sector figures represent the S&T funded by Commonwealth bodies from their own ds (other than direct appropriations). These consist mainly of trading revenues of ernment enterprises, disposals of plant and sales of publications. They also include iduals of appropriations retained from previous years. The sum of the Budget and -Budget sectors constitutes all direct funding by the Commonwealth Government. enditure from other sources covers S&T activities funded by recoveries (and hence luded from the Budget sector) plus amounts received by the Commonwealth from sources h as industry and State or foreign governments in respect of particular activities of a -commercial nature.

accompanying text is a brief of the activities listed in the relevant tables. ever, for selected agencies, illustrative details are also given. As in previous tements, the aim has been to list expenditures of each agency or program for all years er the Ministry which holds responsibility for that agency or program at the time the tement is drafted. Unless stated otherwise, sources for the information presented in tables are the agencies listed.

A.2 DERIVATION AND VALIDATION

a for the Science and Technology Statement are derived through a survey of about agencies or units of the Commonwealth Government. These respondents return over data collection forms for processing by the Department of Science. In a few cases tably for ADAB) there are special data collection procedures. Validity of the data is cked, as far as possible, by staff of the Department of Science (DOS) who refer to ual Reports, Budget documents, departmental explanations of estimates and other erial for this purpose. (For the definitions used see Appendix D).

at stress is placed on continuity of reporting procedures from year to year. In ition, it is sometimes necessary to discuss returns with respondents and amend the urns as a result.

ce the first Science and Technology Statement in 1981, most respondents to these annual veys have established appropriate internal procedures to derive the necessary data. Department of Science is grateful for the continued co-operation of most agencies in provision of material for the Statement. Requests for the provision of data were warded during the period 5-9 August 1985 and follow-up requests were made by telephone re this was necessary.

a variety of reasons, agencies are sometimes slow to provide their survey data. In a isolated cases they are unable to do so in time and these data are estimated by DOS ff. In either case the ability to validate data adequately is correspondingly reduced the data presented for those organisations should be regarded appropriately. Such anisations, whose data largely derive from DOS estimates, are marked by an ampersand in ministry tables.

A.3 ABORIGINAL AFFAIRS

($ million)		R&D					S&T (including R&	
						Projected	Project	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Aboriginal Affairs	S(c)	0.094	0.057	0.101	0.150	0.08&	0.15&	0.0
Australian Institute of Aboriginal Studies (AIAS)	S(a)	-	-	-	-	-	0.262	0.1
	S(b)	-	-	-	-	-	1.779	2.1
	^{n}S(c)	0.530	0.468	0.344	0.384	0.350	1.282	1.2
Total (Budget sector)		0.623	0.525	0.446	0.534	0.430	3.473	3.5
B. Commonwealth Non-Budget sector								
Australian Institute of Aboriginal Studies (AIAS)	S(a)	-	-	-	-	-	0.037	0.0
	S(b)	-	-	-	-	-	0.252	0.2
Total (Non-Budget sector)		-	-	-	-	-	0.289	0.2
Total (Direct Commonwealth funding)		0.623	0.525	0.446	0.534	0.430	3.762	3.8
C. Expenditure from other sources								
Australian Institute of Aboriginal Studies (AIAS)	S(a)	-	-	-	-	-	0.010	0.0
	S(b)	-	-	-	-	-	0.068	0.0
Total (Other sources)		-	-	-	-	-	0.078	0.0
Total (A+B+C)		0.623	0.525	0.446	0.534	0.430	3.840	3.8

N	Natural sciences and engineering	S	Social sciences and humanities
^{n}S	Includes some natural sciences and engineering		
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure	&	DoS estimates

A.3.1 DEPARTMENT OF ABORIGINAL AFFAIRS

e Department's research program is undertaken by outside agencies and is primarily rected to the collection and analysis of data needed by the Government for policy finition and determination.

A.3.2 AUSTRALIAN INSTITUTE OF ABORIGINAL STUDIES

e Institute promotes Aboriginal studies and assists relevant cooperation among iversities, museums and other institutions. This entails the collection, processing and orage of data on all aspects of Aboriginal culture and the facilitation of studies by s own staff and others. Work being undertaken by the Institute includes the eservation of Aboriginal languages, compilation of dictionaries of the main languages, cording of music and dances, taping of oral history and studies of food sources and rbs used by Aborigines. The Institute disseminates information about Aboriginal lture, both by publishing its own findings and making available material from other urces.

A.4 ARTS, HERITAGE AND ENVIRONMENT

($ million)		R&D					S&T (including R&	
					Projected		Projecte	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Arts, Heritage and Environment								
. Bureau of Flora and Fauna	N(a)	-	-	-	0.040	0.020	0.040	0.02
	N(b)	0.034	0.128	0.144	0.055	0.057	0.744	0.82
	N(c)	0.409	0.362	0.465	0.530	0.555	0.908	0.97
. Environmental Activities								
- Australian Environment Council Trust Fund	N(c)	-	-	-	-	-	0.063	0.06
- Other	N(b)	-	-	-	-	-	3.201	3.49
	N(c)	-	-	-	-	-	2.021	2.18
Australian Film and Television School	S(a)	0.015	0.005	-	-	-	-	-
	S(b)	0.094	0.090	0.099	0.110	0.117	0.110	0.14
	S(c)	0.033	0.014	-	-	-	0.004	-
Australian National Parks and Wildlife Service (ANPWS)	N(c)	0.140	0.071	0.191	0.35&	0.43&	0.46&	0.57
Great Barrier Reef Marine Park Authority	N(b)	-	-	-	0.035	0.085	0.238	0.37
	N(c)	0.097	0.032	0.082	0.065	0.323	0.428	1.05
	S(b)	-	-	-	-	-	0.052	0.09
	S(c)	-	-	0.037	0.010	0.009	0.096	0.29
National Library of Australia	N(a)	-	-	-	-	-	1.481	1.71
	N(b)	-	-	-	-	-	0.326	0.32
	S(a)	-	-	-	-	-	2.698	3.09
	S(b)	-	-	0.005	-	-	10.446	10.44
	nS(c)	0.007	0.011	0.017	-	-	-	-
Office of the Supervising Scientist for the Alligator Rivers Region	N(a)	1.654	2.855	0.994	0.527	2.000	0.527	2.00
	N(b)	2.060	2.814	3.264	3.869	4.265	3.869	4.26
	N(c)	0.333	0.313	0.245	0.348	0.235	0.348	0.23
Total (Budget Sector)		4.876	6.694	5.542	5.945	8.101	28.067	32.17
B. Commonwealth Non-Budget sector								
Great Barrier Reef Marine Park Authority	N(c)	-	-	-	-	-	-	0.06
Total (Non-Budget Sector)		-	-	-	-	-	-	0.06
Total (Direct Commonwealth funding)		4.876	6.694	5.542	5.945	8.101	28.067	32.23

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
. Expenditure from other sources								
epartment of Arts, Heritage and Environment								
. Environmental Activities								
- Australian Environment Council Trust Fund	N(c)	-	-	-	-	-	0.063	0.069
ational Library of Australia	S(c)	0.001	-	-	0.003	-	0.003	-
Total (Other sources)		0.001	-	-	0.003	-	0.066	0.069
Total (A+B+C)		4.877	6.694	5.542	5.948	8.101	28.133	32.305

N Natural sciences and engineering

S Social sciences and humanities

$_{n}S$ Includes a small component of Natural Sciences and engineering

^{s}N Includes some social sciences and humanities

(a) Intramural capital expenditure (for the National Library includes monographs, serials, films and data bases)

(b) Intramural current expenditure

(c) Extramural expenditure

& DoS estimates

A.4.1 DEPARTMENT OF ARTS, HERITAGE AND ENVIRONMENT

- Bureau of Flora and Fauna

The Bureau of Flora and Fauna is responsible for conducting the Australian Biological Resources Study (ABRS). Its main work is to develop and promote studies of the taxonomy and distribution of the Australian flora and fauna. Working in close collaboration with other Commonwealth and State agencies the Bureau plans, coordinates and directs the national effort to describe and document Australia's vast and unique biota.

The ABRS Participatory Program provides grants to support individual projects within the objectives of the Study. The staff of the Bureau are also involved in scientific work essential to national taxonomic documentation.

- Environmental Activities

The Environment Division provides the focus for Commonwealth responsibilities in environmental matters and for communication with international environmental agencies, particularly the United Nations Environment Programme and the Environment Directorate of the OECD. In general, the Division is responsible for policy advice, developing proposals, administering legislation, implementing programs, carrying out studies and assessments and general coordination of Commonwealth environmental interests.

A National Air Quality Data Program is being commenced to expand the data provided by the States to the Natonal Air Quality Data Centre. This data is used for the development of long term strategies for the control of motor vehicle emissions and the establishment of national air quality goals and standards.

A National Notification and Assessment Scheme for industrial chemicals is being developed. The department is also completing a National Inventory of Existing Chemicals.

Marine environment activities have included work on the marine quality assessment program which includes monitoring baseline pollution levels and bio-indicator studies.

Environment studies undertaken by the Environment Policy Division include measurement of the costs of environment protection measures, utilisation of environment statistics, and the evaluation of the environmental implications of present and proposed public policies that may be environmentally important.

The responsibility of the Division also includes the administration of grants to voluntary conservation bodies, and the provision of secretariat and other support services to the Australian Environment Council, the Australian Council of Nature Conservation Ministers and the Australian Ionising Radiation Advisory Council.

A.4.2 AUSTRALIAN FILM AND TELEVISION SCHOOL

The School's Research and Information Section brings together the Book and Film Libraries, the Resources Unit and the Research and Survey Unit. The Section collects data, undertakes research and disseminates information on all aspects of the radio, film and television industries. This assists the formulation of the School's training policy and provides resources for students of media in all tertiary courses and for the industry.

Research and Information Section also co-ordinates and disseminates research which has n undertaken elsewhere and co-operates in joint research projects with other allied anisations in the creative and performing arts fields. The quarterly research journal dia Information Australia" is also produced by the Section and receives support from Australian Broadcasting Corporation (A.7.2), Australian Broadcasting Tribunal (A.7.3), tralian Film Commission, Special Broadcasting Service and Telecom Australia (A.7.5). August 1985 a special satellite issue of "Media Information Australia" was published, h the sponsorship of AUSSAT (A.7.5).

er research activities include an evaluation of the Australia wide, On the Job Training Women Scheme, which has been giving women training in various technical jobs in the m and television industry, and the development of its computerized information rieval database to provide public access to media material nationally, via ACI's online abase network, AUSINET.

A.4.3 AUSTRALIAN NATIONAL PARKS AND WILDLIFE SERVICE

Australian National Parks and Wildlife Service is responsible for providing policy ice to the Commonwealth Government. It's role embraces both terrestrial and marine ure conservation issues which are nationally and internationally significant. The vice's diverse role necessitates extensive information requirements for policy elopment and for planning and managing national parks.

entific information gathering is achieved primarily through the Service's Research and vey Program. The prime objective of this program is to sponsor research, survey and itoring projects to collect information on ecological resources and ecological cesses. The program covers a wide range of nature conservation policy and park agement related issues.

A.4.4 GREAT BARRIER REEF MARINE PARK AUTHORITY

Great Barrier Reef Marine Park Authority (GBRMPA) is responsible for the development care of the Great Barrier Reef Marine Park within the Great Barrier Reef Region.

Authority's research role is principally to secure information needed for marine park nning and management.

Authority is concerned with three broad areas of research:

- studies of marine organisms and ecosystems, reef geomorphology, hydrology and other aspects of the biological and physical environment. A sound, basic understanding of what constitutes the Reef and how it has evolved is fundamental to the development and monitoring of the Authority's zoning and management plans;
- knowledge of the impact of human uses on the biological and physical environment, leading to identification of the levels of use at which critical damage begins to occur; and
- demographic, sociological and economic studies which will enable the Authority to anticipate changing patterns and intensities of use and adjust its planning accordingly.

Current research projects include:

- Remote Sensing applications with the aim of developing signatures for Great Barrier Reef features continues as a R&D activity.

- The study of dugong populations including development of survey techniques is being undertaken in a 3 year project commencing in 1985-86, based on a pilot project undertaken in 1984-85.

- A major new development is the allocation of money for a major research program into the Crown of Thorns Starfish. NSE components of the project are: data analysis and modelling (a priority research area); paleoclimates; review workshop; risk analysis; biological control; geological sedimentology; and an ecological project to be undertaken by the Australian Institute of Marine Science (A.21.3) with GBRMPA funding. The SSH component includes investigations on human causes, oral history and socio-economic effects. The program is scheduled to continue for four years.

- The collaborative program on flow modelling conducted by GBRMPA, AIMS (A.21.3) and James Cook University continues through 1984-85 and 1985-86 as a major oceanographic research.

- In the S&T field significant components continue to be: biological data collection and analysis, with emphasis, in 1984-85, on actually or potentially harvested species and associated effects; coral trawl fishing; demersal fish, prawns and clams; survey of reefs and associated flora and fauna. All studies aim to provide information applicable to planning and management of the GBR Marine Park.

- Research ongoing in 1984-85 to be completed in 1985-86 include a survey of charter boats, attitudes of Marine Park users and traditional fishing in Aboriginal communities. These studies are designed to provide data of immediate use in Marine Park planning and management.

- Development of a geographical information system to handle the GBR database. This project is continuing in 1985-86 and will include information on marine research currently underway.

A.4.5 NATIONAL LIBRARY OF AUSTRALIA

The National Library of Australia has a statutory responsibility to:

- maintain and develop a national collection of library materials in all areas of science and technology;

- make these materials available, through reference, current awareness and retrospective search services by traditional or computer based methods; and

- encourage the development of resource sharing networks among libraries and organisations with similar objectives in order to ensure that scientific and technological information is readily available to the nation.

research project on Braille reading trends in Australia was supported in 1984-85.

e National Library Fellowship Scheme has been established with the following aims:

to provide the Library as a centre of scholarly activity and research

to encourage scholarly use of the collections and the production of publications based on them

to publicise the Library's collections.

A.4.6 OFFICE OF THE SUPERVISING SCIENTIST FOR THE ALLIGATOR RIVERS REGION

recognition of the unique environment of the Alligator Rivers Region and the interests the Aboriginal people of the area, the Ranger Environmental Inquiry recommended the ablishment of a complex regime of environmental protection measures, including ointment of a Supervising Scientist for the Alligator Rivers Region, to guard against nage to the environment by uranium mining operations.

hough the Supervising Scientist for the Alligator Rivers Region has a supervisory, rdinating and research role it should be noted that the Supervising Scientist's ervisory function is not associated with the power to direct operations or to enforce such direction. Under agreed arrangements, the Northern Territory supervising horities are responsible for day-to-day regulation of the uranium mining and milling ivities.

damentally the work of the Supervising Scientist is directed towards:

acquiring an adequate knowledge of the environment and of uranium mining operations and practices in the Region, and of the best practicable technology used anywhere in the world for such operations and practices, so as to be able to assess the actual and potential environmental impact of mining in the Region;

promoting and assisting in the development of standards, practices and procedures for use in uranium mining operations in the Region, and of measures for the protection and restoration of the enviroment, such that those operations are carried out in accordance with best practicable technology;

providing co-ordinated advice to the various parties (Commonwealth, Northern Territory, private sector, and traditional land owners) who have a close interest in the extent to which the environment is likely to be affected by uranium mining in the Region; and

assessing the adequacy with which the environment is protected and restored.

Supervising Scientist manages the Alligator Rivers Region Research Institute, which ducts a multi-disciplinary research program, components of which include aquatic logy, terrestrial ecology, analytical chemistry, geomorphology and hydrology.

A.5. ATTORNEY-GENERAL'S

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Australian Institute of Criminology	S(a)	0.001	0.001	0.018	0.077	0.023	0.152	0.045
	S(b)	0.470	0.425	0.520	0.640	0.691	1.844	2.003
Commonwealth Legal Aid Council	S(b)	0.177	0.159	0.035	0.046	-	0.046	-
	S(c)	0.041	0.086	0.065	0.120	-	0.120	-
Criminology Research Council	S(c)	0.030	0.054	0.036	0.075	0.095	0.075	0.095
Human Rights Commission	S(a)	-	0.117	0.024	0.047	0.021	0.050	0.022
	S(b)	0.263	0.513	0.841	1.151	1.335	1.231	1.427
	S(c)	0.004	0.089	0.029	0.106	0.195	0.281	0.445
Institute of Family Studies	S(a)	-	0.018	0.042	0.002	0.149	0.003	0.225
	S(b)	0.418	0.510	0.596	0.702	0.588	0.967	0.833
	S(c)	0.250	0.114	0.012	0.006	-	0.006	-
Law Reform Commission	S(a)	-	-	0.125	0.154	0.039	0.154	0.039
	S(b)	1.163	1.373	1.732	2.396	2.401	2.396	2.401
	S(c)	-	-	0.008	-	-	-	-
Total (Budget sector)		2.816	3.459	4.083	5.522	5.535	7.325	7.535
B. Commonwealth Non-Budget sector								
Australian Institute of Criminology	S(a)	-	-	-	-	-	0.001	0.001
	S(b)	-	-	-	-	-	0.014	0.057
Criminology Research Council . Attributable to past Commonwealth contributions	S(c)	0.012	0.013	0.013	-	-	-	-
Law Reform Commission	S(a)	-	-	0.004	0.002	-	0.002	-
	S(b)	0.019	0.075	0.055	0.026	0.017	0.026	0.017
Total (Non-Budget sector)		0.031	0.088	0.071	0.027	0.017	0.043	0.075
Total (Direct Commonwealth funding)		2.847	3.547	4.155	5.549	5.552	7.368	7.610

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Expenditure from other sources								
iminology Research Council								
Attributable to State contributions	S(b)	-	-	-	-	-	0.005	0.007
	S(c)	0.042	0.066	0.050	0.075	0.095	0.075	0.095
v Reform Commission								
Attributable to State	S(a)	-	-	0.003	0.004	-	0.004	-
contribution	S(b)	-	-	0.036	0.065	-	0.065	-
Total (Other sources)		0.042	0.066	0.088	0.144	0.095	0.150	0.102
Total (A+B+C)		2.889	3.613	4.243	5.694	5.647	7.517	7.712

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure		

A.5.1 AUSTRALIAN INSTITUTE OF CRIMINOLOGY

e Institute's principal function is to conduct such criminological research and dertake conferences, seminars and workshops as are approved by the Board of Management matters related to the prevention of crime and treatment of offenders. The results of ch activities are communicated to the appropriate Commonwealth and State Government encies.

ring the period 1984-85 the Institute's research activities included work on the llowing subjects - Aboriginal Criminal Justice, Corporate Harm/Corporate Crime Case udies, Community Based Corrections Data, National Study of Deaths in Prison, National rrectional Statistics, Political Terrorism, Public Order Policing, Prosecutorial scretion and Sentencing of Armed Robbers.

inars conducted by the Training Division during the same period included those on rglary and Community Policing, Developmental Programs for Prisoners, Justice Programs Aboriginals and other Indigenous Communities, Prosecutorial Discretion and a Review of stralian Criminological Research.

A.5.2 CRIMINOLOGY RESEARCH COUNCIL

The Criminology Research Council was established in 1972 to control and administer the Criminology Research Fund and to determine the manner in which the moneys in the Fund are applied to criminological research. The State Governments match the Commonwealth Government's annual contributions to the Fund on a dollar for dollar basis, individual State Government contributions being determined on a pro rata population basis.

The Council invites applications for research grants from individuals and organisations wishing to undertake research on matters concerned with the causes, correction and prevention of criminal behaviour and related affairs. To date the Council has funded over 120 research projects extending over a wide range of subjects. Grants approved during 1984-85 included several concerned with recidivism, parole system assessment, Aboriginal, Police and community relations, crime prevention strategies for unemployed youth and Police participation in tertiary education. The Australian Institute of Criminology provides administrative and secretarial services to the Council.

A.5.3 COMMONWEALTH LEGAL AID COUNCIL

The Commonwealth Legal Aid Council was established by section 4 of the Commonwealth Legal Aid Commission Amendment Act 1981, which came into operation on 1 July 1981. The Council replaced the Commonwealth Legal Aid Commission which was abolished by the legislation mentioned above. The Commonwealth Legal Aid Council ceased operations on 30 June 1985.

A.5.4 INSTITUTE OF FAMILY STUDIES

The Institute of Family Studies was established to conduct, encourage and coordinate research into the factors affecting marital and family stability in Australia. It also collects, analyses and disseminates information on the impact of government policies and social change on families.

The Institute advises and assists the Attorney-General on the making of grants for purposes related to its functions and supervises the employment of such grants.

A.5.5 THE LAW REFORM COMMISSION

The Commission was established as a result of the Government's decision to modernise, simplify, eliminate defects in, and adopt more effective methods for administering the law and dispensing justice.

The Commission works pursuant to references from the Commonwealth Attorney General. The final product of the research undertaken in the Commission is a Report to the Commonwealth Parliament. Reports contain a full discussion of an area of law which needs to be developed, changed or modernised as well as draft legislation.

A.5.6 HUMAN RIGHTS COMMISSION

The Human Rights Commission was established in December 1981. Its mandate is to ensure that the laws of the Commonwealth and acts and practices under those laws conform with the provisions of the International Covenant on Civil and Political Rights, the Declaration of the Rights of the Child, the Declaration on the Rights of Mentally Retarded Persons and the Declaration on the Rights of Disabled Persons. The Commission is also responsible for the administration of the Racial Discrimination Act 1975 and the Sex Discrimination Act 1984.

Commission's Research program involves three main strands - research stemming from al complaints to the Commission, research following a reference of existing or draft slation by the Attorney-General, and research which the Commission considers to be of rity concern for the promotion of human rights in Australia.

r projects supported in 1984-85 include: effects of the school system on students non-English speaking backgrounds; human rights and Commonwealth prisoners; rights isabled persons in institutions; Aboriginal autonomy and political participation; lopment of a human rights curriculum for schools; statistics on complaint handling, uman rights seminars.

A.6 AVIATION

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Aviation								
. Air transport forecasting, statistics and ADP	S(a)	-	-	-	-	-	0.015	-
	S(b)	-	-	-	-	-	1.020	1.105
	S(c)	-	-	-	-	-	0.025	0.017
. Bureau of Air Safety Investigation	S(b)	-	-	0.060	0.063	0.066	0.063	0.066
. Major Projects	S(b)	0.014	0.020	0.022	0.024	-	0.055	0.030
	S(c)	-	-	-	-	-	0.058	-
. Provision of Meteorological Services	N(c)	-	-	-	-	-	15.700	15.965
. Provision, Operation & Maintenance of Airways Facilities	N(a)	0.700	0.380	0.400	0.400	0.400	4.400	1.400
	N(b)	0.270	0.300	0.300	0.300	0.300	0.800	0.800
	N(c)	0.235	0.235	0.260	0.240	0.240	0.240	0.240
. Regulation of Air Transport								
- Environment and security	S(c)	0.014	-	-	-	-	-	-
	N(a)		0.003	-	-	-	-	-
	N(b)	-	0.028	0.014	-	-	-	-
- Aviation medicine	N(c)	0.024	-	-	-	-	0.108	0.106
- Airworthiness	N(c)	0.071	0.050	0.145	0.152	0.121	0.152	0.121
Total (Direct Commonwealth funding)		1.327	1.013	1.201	1.179	1.128	22.636	19.851

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure		

A.6.1 DEPARTMENT OF AVIATION

- Bureau of Air Safety Investigation

The Bureau of Air Safety Investigation is responsible for investigating all civil aircraft accidents and incidents occurring in Australia and its Territories. The specialist Air Safety Research Group continues to be involved in a variety of ongoing projects with the following objectives:

- Development of improved methodologies (quantitative and qualitative) for analysis and evaluation of the Bureau's computerised accidents and incidents database.

- Analysis of accident patterns and factors in specific categories, eg, agricultural aviation, single pilot and ultralight aviation, commuter operations.

- Use of the Evans & Sutherland PS300 computer graphics system, interfaced with FRAN (Flight Data Recorder Analysis Section) to provide a real-time re-creation of flight data from airline accident/incident situations. The flight path, or 3D perspective of the flight path (from any angle) and instrument displays in incident situations may be re-created and animated using real-time vector graphics display.

Major Projects (Airport/Airways Development)

umber of master planning studies associated with the development of major airports ound Australia are continuing. eg, achievement of refined apron/gate demand model used ensively in major airport projects, use of Computer Modelling Techniques in the design Airports, Public Opinion survey related to Melbourne Airport Masterplan, and provision turnkey computer system for use in modelling various elements of an Airport, including iways, terminal buildings and road networks.

Provision, Operation and Maintenance of Airways Facilities

Department has obligations under the Air Navigation Act and Regulations and mitments arising from Australia's membership of the International Civil Aviation anisation (ICAO) which require the establishment, provision, maintenance and operation air route and airway facilities and associated services. The objective is to ensure continued safe, efficient and economic performance of the national network of airways ilities and services and to ensure that the network expands or changes as necessary to t Australia's future air transport needs.

capital expenditure reported includes a large expenditure for the installation of th stations in conjunction with the use of the national communications satellite when becomes operational in 1985-86.

Regulation of Air Transport

- Environment and security

Department is responsible for policy, standards and procedures on aircraft noise and er environmental matters associated with aircraft operations as well as aviation urity policy and procedures. It also co-ordinates operational (airways/airports) tective security and related intelligence arrangements.

- Aviation medicine

Department has a continuing commitment to discharge statutory obligations and ponsibilities by establishing and enforcing medical standards for flight crew and air ffic controllers to ensure the maintenance of safe flying operations. Activities lude:

ARL Crash Protection Program: Knowledge of the effect of impact forces on aircraft structures and restraint device performance; biognostic studies of simulated impacts to be made in conjunction with the Accident Injury Databank of General Aviation Crash Injuries and Fatalities - ongoing for policy formulation.

Head injuries and oxygen saturation - study completed.

- ATC Hearing Test Development: an occupationally-based speech test for use with hearing-impaired Air Traffic Controllers, and eventual extension to Flight Crew hearing tests - formulation of licensing standards.

- Bifocal Contact Lenses: examination of likely problems in piloting; evaluation of new contact lenses designed for presbyepes pilots - policy formulation.

- Hypoxie-effects on Psychomotor and Visual Performance: evaluation of the effects of mild hypoxie equivalent to 5000 to 1000 feet on Psychomotor skills and performance and visual physiology - policy formulation.

  - Airworthiness

Funds expended at Aeronautical Research Laboratories support continuing research into various aeronautical safety areas, including composite aircraft material, fatigue life enhancement, corrosion, etc.

The Royal Melbourne Institute of Technology's funding support full-scale fatigue testing of a Janus glass fibre composite construction glider wing, to determine viable life of the aircraft - an ongoing project.

The Australian Atomic Energy Commission (A.20.2) project involves developing improved ways of presenting data derived from non-destructive test equipment, particularly from ultrasonic and eddy-current inspection equipment. The Government Aircraft Factories were involved in research into flight testing of Nomad N22 aircraft and software; no funding is expected in 1985-86.

- Provision of Meteorological Services

The Department is obliged to obtain meteorological services from the Bureau of Meteorology as part of the statutory responsibilities for the safety of aircraft operations. The services are provided in accordance with Air Navigation Regulations and working arrangements between the Department of Aviation and the Bureau of Meteorology.

- Air Transport Forecasting and Statistics

Science and Technology activities are the collection and publication of aviation activity statistics, the forecasting of aviation activity by airports for the period 1985-2010 plus aggregate short-term forecasts for policy formulation. Also included are costs associated with computer processing of statistical data collected by the Department's Central Statistical Section.

The Forecasting and Evaluation Section is developing a manual to guide engineers and other technical officers in the financial and economic evaluation of investment proposals and intended regulatory changes in the aviation sector. The manual will concentrate on cost/benefit and cost effectiveness analyses of such projects as airport and airway facilities upgrading. However it is intended that the manual will facilitate evaluation of regulatory change as well. The first of the two volumes will be a guide to conducting such evaluation and Vol 2 provides explanation and justification for the content of Vol 1.

A.7 COMMUNICATIONS

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
ommonwealth Budget sector net expenditure								
rtment of mmunications	N(a)	-	-	-	-	-	0.28&	0.29&
	N(b)	-	-	-	-	-	0.33&	0.42&
	S(b)	0.012	-	-	-	-	-	-
	S(c)	0.043	-	-	-	-	-	-
ralian Broadcasting rporation	N(a)	0.030	0.049	0.080	0.085	0.027	0.170	0.054
	N(b)	0.093	0.129	0.208	0.231	0.200	0.462	0.400
ralian Broadcasting ibunal	$_n$S(b)	0.195	0.186	0.142	0.072	0.015	0.188	0.163
	$_n$S(c)	0.144	-	-	-	-	0.039	0.044
otal (Direct Commonwealth funding, excluding BE)		0.518	0.364	0.430	0.388	0.242	1.482	1.375
ommonwealth Non-Budget sector								
ralia Post BE	N(a)	0.085	0.065	0.078	0.08&	0.08&	0.24&	0.24&
	N(b)	0.459	0.707	1.030	1.04&	1.04&	2.68&	2.68&
	N(c)	0.085	0.085	0.091	0.08&	0.08&	0.28&	0.28&
seas Telecommunications mmission, Australia TC) BE	N(a)	-	-	-	0.064	0.723	0.064	0.723
	N(b)	-	0.013	0.047	0.450	1.660	0.450	1.660
	N(c)	0.345	0.592	0.443	0.648	2.395	0.724	2.435
com Australia BE luding AUSSAT)	$_s$N(a)	6.25	4.77	4.81	3.56	6.26	8.06	13.66
	$_s$N(b)	31.75	36.93	36.38	39.76	44.97	85.16	100.57
	$_s$N(c)	0.72	0.91	1.31	1.26	2.08	13.26	15.08
otal (Non-Budget sector)		39.69	44.07	44.20	46.96	59.30	110.94	137.34
otal (Direct Commonwealth funding, including BE)		40.21	44.43	44.63	47.34	59.54	112.42	138.72
xpenditure from other sources								
com Australia BE	N(a)	0.050	0.034	0.031	0.009	0.013	0.009	0.013
	N(b)	0.250	0.266	0.269	0.111	0.097	0.111	0.097
otal (Other sources)		0.300	0.300	0.300	0.120	0.110	0.120	0.110
otal (A+B+C)		40.51	44.73	44.93	47.46	59.65	112.54	138.83

N Natural sciences and engineering S Social sciences and humanities
nS Includes small proportion of natural sciences and engineering

sN Includes small proportion of social sciences and humanities

(a) Intramural capital expenditure (b) Intramural current expenditure
(c) Extramural expenditure & DoS estimates

BE Wholly Commonwealth-owned business enterprise

A.7.1 DEPARTMENT OF COMMUNICATIONS

The Department of Communications' responsibilities include the policy and technical aspects involved in developing and maintaining broadcasting services and the management and use of the radio frequency spectrum.

A.7.2 AUSTRALIAN BROADCASTING CORPORATION (ABC)

The ABC has the responsibility to provide adequate and comprehensive television and radi programs throughout Australia. To further this aim, its R&D activities cover the design using innovative techniques where appropriate, of specialised equipment which is not otherwise available. Technical support is also given to facilitate the introduction of technological changes into the ABC's operations and to allow effective liaison with overseas and Australian organisations.

A.7.3 AUSTRALIAN BROADCASTING TRIBUNAL

The Australian Broadcasting Tribunal is responsible for matters relating to licensing an overseeing of public and commercial broadcasting and commercial television stations.

The Research Branch of the Tribunal provides background papers and statistical analyses. During 1984-85 no new major projects were undertaken. Continuing projects are:

- Survey of Australian television production (published October 1984).
- Survey of Young Australians and Music (published in October 1985).
- Analysis of the content of programs televised during sample periods in 1984-85.

A.7.4 AUSTRALIAN POSTAL COMMISSION ('Australia Post')

The Postal Services Act requires that the Commission perform its functions in such a manner as will best meet the social, industrial and commercial needs of the Australian people. In providing these services, the commission is required to have regard to the need to operate its services as efficiently and economically as practicable. It must ha regard also to the special needs for postal services of Australian people who reside or carry on business outside the cities and the desirability of improving and extending its postal services.

The Commission, which trades as 'Australia Post', carries out research and development aimed at providing new and improved products, services, management systems, procedures a techniques which have been identified as important for the achievement of its broad objectives. Current research is directed towards developing electronic mail containerisation, robotics, control circuity and mail coding.

A.7.5 AUSTRALIAN TELECOMMUNICATIONS COMMISSION ('Telecom Australia')

e provision of telecommunications services and the ongoing development and efficient eration of the national telecommunications network infrastructure are hnology-dependent. Hence, the general thrust of Telecom Australia's R&D and S&T ivities is towards the timely adoption of appropriate technology to assist Telecom to fil its charter to provide, maintain and operate national telecommunications services ch meet the social, industrial and commercial needs of people throughout Australia, h charges that are as low as practicable, and to keep these services up to date through e efficient and economic development and operation of the national network rastructure.

ority objectives of Telecom's S&T and R&D activities are:

- the introduction of new customer services, facilities and products,
- the provision of automatic telephone and data transmission services to customers in the remote parts of Australia,
- the introduction, through microelectronics, microwave radio, satellite and optical fibre technology, of digital switching and transmission techniques and computer control of switching systems into the national network infrastructure, to improve service standards and create a flexible network infrastructure which can evolve to provide an integrated services digital network, with international accessibility and quality, in the 1990s,
- the maintenance of network integrity and survivability.

ecom's R&D activities are directed at the development of an independent competence hin Telecom for the evaluation of world trends in telecommunications science and hnology, to assist the planning and specification of new developments relevant to the tralian telecommunications environment. The development of such competence is ecially important in the Australian context since Australia is relatively isolated from e world centres of telecommunications R&D. Telecom's R&D also provides specialist wledge and facilities for the solution of unusual technical problems arising in the ration of its networks, and a basis for Telecom's contributions to the development of ernational standards for telecommunications.

ecom's R&D activities provide an input to Telecom's wider S&T activities, which are cerned with technical innovations leading to the planning, development, implementation operation of:

- new or improved services, facilities and products,
- expansion and development of the network infrastructure,
- improved network management, administration and integrity,
- improved operational and maintenance practices.

Telecom's R&D and S&T activities range over the whole spectrum of telecommunications ence and engineering. Projects cover:-

- research related to techniques, technologies and standards with longer term potential for application in customer services or network systems,

- investigations related to the planning, specification and adaptive design of customer services and network systems for medium term implementaton,

- solution of technical problems arising in the operation of systems, equipment, components and materials in the network,

- development of new or improved network management systems and operational and maintenance practices.

The projects being pursued by Telecom in 1985-86 encompass:-

- digital signal processing and modification, detection and encryption techniques;

- single mode optical fibre transmission systems;

- digital microwave radio transmission systems;

- software architectures and specification and description techniques for real tim control of telecommunications systems;

- common channel signalling techniques in stored program controlled exchange networks;

- communication protocols; for multi-mode (voice, text, image, data) communication in multi-services network environments;

- circuit and packet switched digital networks for voice and data;

- telecommunications network dimensioning and dynamic management techniques;

- digital reticulation in the local subscriber transmission network;

- customer access and network interface standards for the evolution of an Integrated Services Digital Network;

- advanced voice and non-voice, real-time and non-real-time business communication services and networks;

- radiocommunications antennas and propagation techniques;

- microelectronics technology;

- advanced semiconductor and optical devices;

- reliability of telecommunications plant and equipment;

- scientific techniques for the assessment of hazards (chemical, electrical, etc) arising in telecommunication operations, and for the protection of both personne and plant from such hazards.

Significant achievements during 1984-85 include:-

- introduction of Touchfone Mark IV, a new standard telephone with push-button dialling, and other premium and business telephones, including Decorator telephones and Computerphone;

- extended introduction of a new generation AXE digital telephone exchanges in the national public switched telephone network;

- extension of international subscriber dialling facilities and automated call charged recording;

- introduction of enhanced, network-based Easycall facilities for telephone customers connected to new generation exchanges;

- steady progress in providing automatic services to customers living in the more remote parts of Australia with the introduction of the Digitial Radio Concentrator System and implementation planning for the Iterra Network Service over the national communications satellite in 1986;

- introduction of new generation digital private automatic branch exchanges (PABX);

- introduction of the Orator audio-conferencing terminal;

- introduction of the Securitel service for remote supervision of security alarms at customer premises;

- commencement of the installation of an optical fibre trunk transmission system linking Melbourne, Canberra and Sydney;

- introduction of the Viatel videotex service;

- implementation planning for the forthcoming introduction of Telememo and Teletex computer-based text communications services;

- extended development of data services and networks, eg to enable Electronic Funds Transfer (EFT) services to be offered at point-of-sale by financial institutions;

- extension of automatic mobile radio telephone services to mainland capital cities and planning for future enhancements of these services by the utilisation of cellular, digital radio transmission techniques;

- continued joint development, with LM Ericsson (Australia) of a digital, computer-controlled exchange for rural applications;

- formulation of polymer materials for reliable application in telecommunications plant; and

- analytical techniques for the assessment of hazardous chemicals arising in telecommunications operations.

vestigations made by AUSSAT Pty Ltd include:

- Test B-MAC equipment to be used for HACBSS services,
- test Minor Earth Stations,
- new services which can be provided by AUSSAT, eg Video conferencing, spread spectrums for small earth stations, TDMA, etc,
- colloboration with CSIRO (A.21.4) on Multiple Feed Antenna Project,
- study of the performance of Half-Transpender TV transmission,
- development of software to model the satellite link,
- study of the effect of rain attenuation and depolarisation on satellite link.

A.7.6 OVERSEAS TELECOMMUNICATIONS COMMISSION (Australia) (OTC)

The Overseas Telecommunications Commission (Australia) is responsible for the establishment, maintenance, operation and development of all public telecommunications services between Australia and other countries, between Australia and its external territories and with ships at sea. Its R&D activities and supported projects, which encompass telecommunications, submarine cable and satellite technologies, are funded from trading revenues.

In 1983 OTC established its own external Research and Development Board whose main objective is to guide research and development funded by the Commission. The establishment of the R&D Board is part of an expanded R&D program being undertaken by OTC. The program is directed towards servicing the future technological needs of the international telecommunications business, including research in physics, engineering and communications theory.

OTC's expenditure on R&D for 1985-86 will be shared between internal studies by the Commission's own staff and external contracts placed with industry and research institutions.

Internally, an optical laboratory is being established for conducting experiments in submarine fibre optic communication and computing facilities are being acquired to perform simulation and other network related studies.

Externally, contracts have been let for long term programs in opto-electronic devices, roof top satellite earth stations and tele-traffic engineering. Projects relating to the Digital Modulation of Analogue Submarine Cables and the development of a USA/Australia Data Transmission Converter will continue. Further contracts are being finalised for system studies associated with submarine optical communications.

In the S&T category, OTC has funded the establishment of a centre of expertise in radio frequency interference prediction at a research institution in NSW which will assist in locating new satellite earth stations.

As well as direct OTC expenditure on R&D, as a member of the International Telecommunications Satellite Organisation (INTELSAT) and the International Maritime Satellite Organisation (INMARSAT) OTC contributes to the funding of R&D programs conducted by these organisations. This expenditure has been included in the extramural R&D activities, although it is primarily expended outside Australia.

A.8 COMMUNITY SERVICES

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
ommonwealth Budget sector net expenditure								
rtment of Community Services								
ffice of Child Care	S(b)	0.082	0.012	0.021	0.02&	0.02&	0.19&	0.20&
	S(c)	0.124	0.041	0.079	-	-	-	-
tudies on Rehabilitation and Services for the Handicapped	S(c)	0.113	0.399	-	-	-	0.25&	0.51&
elfare Research	S(b)	-	-	-	-	-	0.12&	0.12&
	S(c)	-	-	0.065	0.03&	0.35&	0.06&	0.37&
ocial Welfare Policy Secretariat	S(b)	0.642	0.602	0.657	0.63&	0.77&	0.63&	0.77&
	S(c)	-	0.023	-	-	-	-	-
otal (Direct ommonwealth funding)		0.961	1.077	0.822	0.69&	1.14&	1.26&	1.98&

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure	&	DoS estimates

A.8.1 DEPARTMENT OF COMMUNITY SERVICES

Department conducts research, evaluation and statistical activities in the context of policy analyses relating to various aspects of the social welfare system, including me security, child care, rehabilitation and services for the aged and handicapped.

Office of Child Care

s of the Office are:

- to provide specific knowledge and information on the effectiveness and appropriateness of current programs;
- to identify the need for new or revised Government initiatives in the area of child care;
- to provide information and advice on the resources available to early childhood services;
- data collection on the provision and use of early childhood services.

- Studies on Rehabilitation and Services for the Handicapped.

Studies carried out are aimed at improving rehabilitation and services for the handicapped through specific program upgrading measures directed at service content, staff development and training.

- Welfare Research

The expenditure reported covers the WELSTAT project, studies of the aged, and the Welfare Research Centre. WELSTAT is a joint State and Commonwealth project concerned with the standardisation and improvement of social welfare statistics. The project is managed by committees consisting of representatives from each State and Territory Welfare department, the Australian Bureau of Statistics, the Commonwealth Department of Community Services and the Social Welfare Policy Secretariat. It is serviced by a Secretariat which operates full time and which is located in the central office of the Department of Community Services.

Extramural expenditures shown represent the Department's contribution to the ACTU for its Welfare Research Unit.

- Social Welfare Policy Secretariat

The Social Welfare Policy Secretariat was established in 1978 and is responsible to the Minister for Community Services. Although it is closely associated with the Department for administrative purposes, the Secretariat is separately staffed and financed and functions as an independent organisation.

The role of the Secretariat is to provide advice on, and promote the coordinated development and review of policies and programs in the broad field of health and welfare; and to promote the direction of appropriate research and statistical activities to these ends.

A.9 DEFENCE

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Commonwealth Budget sector net expenditure								
artment of Defence								
DSTO, Armed Services and Office of Defence Production #	N(a)	8.265	15.743	17.747	22.649	19.302	31.876	27.048
	N(b)	94.378	97.636	102.551	109.227	113.557	192.701	196.777
	N(c)	0.742	1.049	0.914	1.116	1.058	3.970	3.617
Total (Budget Sector)		103.385	114.428	121.212	132.992	133.917	228.547	227.442
Commonwealth Non-Budget Sector Department of Defence DSTO, Armed Services and Office of Defence Production	N(a)	-	-	-	-	-	0.561	0.537
	N(b)	-	-	-	-	-	5.080	5.765
Total (Non-Budget Sector)		-	-	-	-	-	5.641	6.302
Total (Direct Commonwealth Funding)		103.385	114.428	121.212	132.992	133.917	234.188	233.744
Expenditure from other sources								
Department of Defence								
DSTO, Armed Services and Office of Defence Production	N(a)	-	-	-	0.043	0.010	0.051	0.017
	N(b)	1.134	0.085	0.243	0.207	0.059	0.284	0.132
Total (other sources)		1.134	0.085	0.243	0.250	0.069	0.335	0.149
Total (A+B+C)		104.519	114.513	121.455	133.242	133.986	234.523	233.893

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure		

# The Department of Defence now prefers not to provide the disaggregated data available for past statements.

NOTE

The costs shown in the table are estimates of expenditure or actual expenditure incurred against appropriations to the Department of Defence and from other sources. Costs classified as R&D expenditure include:

- Most capital and current expenditure by the Defence Science and Technology Organisation (DSTO); and
- payments to CSIRO for assistance to Defence on environmental matters relevant to land management.

Costs classified as expenditure on S&T (other than R&D) include:

- a portion of DSTO expenditure relating to policy determination, staff training and the operation of library and information services for DSTO Laboratories;
- expenditure by the Office of Defence Production on S&T activities in the aircraft and munition factories;
- expenditure on projects and production development in private industry; and
- expenditure by the Armed Services on S&T work.

A.9.1 DEPARTMENT OF DEFENCE

. Defence Science and Technology Organisation (DSTO)

DSTO's functions are to:

- provide scientific and technical advice on defence policy matters;
- provide scientific and technical support:
    - to the Australian Defence Force in its task of maintaining effective forces in being and for the developent of the Force;
    - for the acquisition of defence material; and
    - for such other matters as specified by the Minister for Defence;
- maintain a technology base to support the Australian Defence Force, the Department of Defence and defence industry; and
- carry out the initial development of selected prototype equipment, to meet approved Defence requirements.

Current projects of significance include the JINDALEE over the horizon radar, the WINNIN active expendable decoy to protect ships against anti-ship missiles, and the KARIWARA buoyant fibre slimline acoustic towed array.

DSTO actively participates in international cooperative programs in science and technology, notably the Technical Co-operation Program (UK, USA, Canada, Australia and NZ)

The work of DSTO is matched to the needs and trends of Australian defence (present and future). While DSTO's work mostly involves its principal customers - the Defence Force and defence industry - there is considerable interaction with other science and technology bodies in the private and public sectors including tertiary institutions both in Australia and overseas.

) has a policy of contracting to industry, wherever possible, development work on jects likely to lead to volume production. DSTO tries to involve industry as early in project as is practicable but needs to have sufficient competence initially to provide) authority" supervision. Some large tasks have been placed in Australian industry, . contracts worth $25m for development of the BARRA sonobuoy and $4.5m for the elopment, operation and maintenance of the JINDALEE Experimental Facility.

)'s program of research agreements with tertiary education institutions continues to w. Current research agreements cover such areas as aerodynamics, lasers, adhesive ding, shock wave effects, aerosol studies, artificial intelligence, high temperature rosion and digital control systems. DSTO is represented on and provides funding for Australian Telecommunication and Electronic Research Board. Funds are also provided the Ocean Sciences Institute.

Office of Defence Production

Office of Defence Production (ODP) was created in December 1984 following the lition of the Department of Defence Support. It incorporated the defence production ablishments formerly within that department. The central task of the ODP is the agement of Government owned and operated factories and dockyards. The ODP is required maintain an industrial capacity needed for strategic purposes.

entific and technological work (other than R&D) is carried out in the Government itions and aircraft factories in support of their functions. The former, of which re are eight, are engaged in producing munitions, explosives, other ordnance and ineering products and a range of equipment ranging from small generating sets to illery and large fire-fighting vehicles.

Government Aircraft Factories, at Fishermen's Bend and Avalon in Victoria, are tralia's main facilities for designing and producing manned and unmanned aircraft, and ded weapons.

Armed Services

Armed Services each conduct some scientific and technological work to meet specific rational needs. Production development of products and production processes are funded private industry. Various extramural tasks are carried out by private industry for the artment. An example is a study to identify and cost engineering options for converting JINDALEE over-horizon radar to a fully operational system.

ramural research and consultancy in relation to land management of Defence properties ch will ensure long term conservation is conducted by the CSIRO.

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Education								
. Australian Council for Educational Research	S(c)	0.370	0.420	0.443	0.492	0.513	0.492	0.513
. CERI participation	S(c)	-	-	-	-	-	0.010	0.012
. Education Research and Development Committee	S(c)	0.679	0.135	-	-	-		-
. Education Review and Evaluation Studies	S(c)	0.070	0.129	0.115	0.155	0.166	0.155	0.166
. Educational use of Communications Technology	S(c)	-	0.048	0.109	0.060	-	0.060	-
. Participation and Equity Program	S(c)	0.236	0.218	0.274	0.294	0.240	0.294	0.240
. Postgraduate Awards	^{S}N(c)	8.537	11.165	14.601	15.416	17.276	17.213	19.290
. Research Statistics and Special Projects Branch	S(b)	0.066	0.040	0.124	0.161	0.105	0.264	0.233
. TAFE National R&D Centre	S(c)	0.212	0.282	0.320	0.345	0.359	0.345	0.359
A.C.T. Schools Authority	S(b)	0.152	0.175	0.131	0.134	0.136	0.166	0.170
Commonwealth Schools Commission	S(b)	0.469	0.200	0.29&	0.72&	0.76&	0.72&	0.76&
	S(c)	0.903	0.406	0.65&	0.78&	0.83&	1.42&	1.47&
Commonwealth Tertiary Education Commission								
. Evaluations and Investigations	S(b)	0.035	-	-	-	-	-	-
	S(c)	0.095	0.095	-	-	-	0.480	0.870
Grants to universities								
. Commonwealth Special Research Centres	^{S}N(c)	1.5	5.9	5.7	5.7	6.0	5.7	6.0
. Other#	^{S}N(c)	85.0	94.0	104.0	114.0	125.0	114.0	125.0
Total (Budget sector)		98.3	113.2	126.8	138.3	151.4	141.3	155.1

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
ommonwealth Non-Budget sector onwealth School ission*	S(b)	0.089	0.063	0.031	0.069	0.084	0.069	0.084
	S(c)	0.077	-	0.010	0.011	0.014	0.292	0.357
otal (Non-Budget sector)		0.166	0.063	0.041	0.080	0.098	0.361	0.441
otal (Direct Commonwealth funding)		98.5	113.3	126.8	138.3	151.5	141.7	155.5
xpenditure from other sources								
rtment of Education ducational use of Communications Technology	S(c)	-	0.048	-	-	-	-	-
otal (Other Sources)		-	0.048	-	-	-	-	-
otal (A+B+C)		98.5	113.3	126.8	138.3	151.5	141.7	155.5

Natural sciences and engineering S Social sciences and humanities

Includes significant proportion of social sciences and humanities

(a) Intramural capital expenditure (b) Intramural current expenditure

(c) Extramural expenditure & DoS estimates

** The amounts which universities spend on research from their general recurrent grants and equipment grants are not included. Total R&D expenditure funded by the Commonwealth in the Higher Education sector was $423.2m in 1981 (ABS - Publ no 8111.0, Oct 1983).

Includes funds specifically earmarked for research in the State Grants (Tertiary Education Assistance) Act or by the institutions themselves from their general recurrent and equipment grants. The figures do not include expenditure on research activities which are part of the general teaching and research functions of the universities. See page 87 for further details.

A.10.1 DEPARTMENT OF EDUCATION

. Australian Council for Educational Research (ACER)

The annual research program and level of funding of ACER is agreed to by the Australian Council (AEC) which provides Commonwealth/State coordination at Ministerial level. As well as receiving the Commonwealth grants shown in the table, ACER also receives matching grants from the States.

The grant to ACER assists it:

- to promote research and development in education in Australia;
- to conduct research and undertake development in any matters affecting education through its own staff and in cooperation with other bodies in Australia and overseas; and
- to disseminate publications and results of research and development.

In 1984-85 the direct Commonwealth contribution represented 50% of the total core grant received by ACER, and 25% of total ACER R&D expenditure for that year.

Broad research programs cover teaching and learning; the social context of education; and measurement and evaluation. These are supported by programs covering library and information services; survey and psychometric services; advisory services; and publishing. The research program contains many diverse projects. Examples of substantial projects current in 1984-85 include:

- Youth in Transition, this is a longitudinal study of two samples of Australian youth, which is now in its seventh year; 6,000 were originally in each cohort. Papers published include studies of the socio-psychological influences on retention in school.
- Alternative Year 12 Curricula; the study assessed retention rates of schools in Victoria with alternative courses in Year 12. The study examines the assumptions underlying the course and the reactions of students to the courses.
- Career Planning and Guidance; work resulting in a Career Development Inventory for Australian students.
- Classroom Environment Study; the study included an assessment of effective teaching practices ie those which promoted desired cognitive or affective outcomes. Implications for practice were evident from the study.

. OECD Centre for Educational Research and Innovation (CERI)

Australian participation in the OECD Centre for Educational Research and Innovation is directed to investigatory exercises in areas such as: Education and New Information Technology; Transition of Handicaped Youth from School to Work; School Improvement; Education and Linguistic and Cultural Pluralism and Innovation exchange.

Educational Use of Communications Technology

Commonwealth/State Advisory Committee was established in 1982 to recommend a balanced ogram of trials or other projects in the educational use of communications technology. e program ran for just over three years ending in October 1985. In 1984-85 the mmonwealth provided $60 000 to match on a dollar-for-dollar basis expenditure by the ates on approved trials and evaluation of the program.

fteen trial projects received funding over the three years of the program. Those ojects of a research nature included experimentation in the coordination of access to e ATS-1 satellite for educational trials; an interactive television teaching program; e use of distance learning materials by the Primary School child as an isolated arner; the use of an FM radio sub-carrier for the provision of tutorial interaction in iversity distance education; facsimile reproduction to increase student-teacher edback in a secondary correspondence school; audio-video-teleconferencing for the -service education of teacher-librarian; use of UHF audio and video to link specialist rvices to rural schools; the development of interactive video and computer learning ograms; electronic mail trials in distance education; teleconferencing trial for riginal education in remote areas; and the potential of communications technology, ecially satellite in increasing access of young people to and delivery of education and aining.

Research, Statistics and Special Projects Branch

Branch is concerned broadly with education at the national level.

luded amongst the Research, Statistics and Special Projects Branch functions are:

- provision of research and analysis resources and statistical services for the portfolio;
- reporting on, reviewing and evaluating existing policies and programs; and
- conducting analytical projects in relation to major dimensions of, or issues in, Australian education with particular reference to coordinated projects involving other parts of the portfolio and other Departments.

Branch conducts in-house studies for these purposes, and manages contracts under the cation Review and Evaluation Studies program and the Participation and Equity Program e below).

Education Review and Evaluation Studies

dies conducted under the Review and Evaluation Program are part of the Department of cation's continuing assessment of its major student assistance and other financial grams, exploration of emergency issues in education, and investigations supportive of icy development. In 1984-85 projects included an assessment of the needs of upported students, a review of assistance for handicapped students, an investigation of chers and computers in the classroom. Projects examining tertiary students' reasons discontinuing their studies and financial assistance for secondary students, begun in 4-85, will continue in 1985-86.

Participation and Equity Program

ds for National Projects and Evaluation within the Participation and Equity Program e spent mainly in the areas of evaluation, research, dissemination and conference ivities.

National Projects and Evaluation allocation was established to provide a modest acity at the national level to take initiatives within a State grants program where the tiative for program development lies mainly with the State authorities.

The projects are policy orientated and developmental in nature, with a view of extending the concept of and policies for transition education. Areas covered by projects current in 1985-86 include a longitudinal study of school leavers and a study of new technologies and PEP.

- Education Research and Development Committee (ERDC)

The Committee advised the Minister on educational research priorities and made education research grants and annual awards as well as arranged dissemination of reports. The ERDC has been abolished and its programs have been terminated following the Review of Commonwealth Functions. The last of its programs was completed by the end of March 1983.

- Postgraduate Awards

There are three categories of postgraduate awards. Research awards are for PhD and Masters research courses in universities. Course awards are for coursework Masters programs in universities. Advanced Education Institution awards are for Masters programs in Colleges of Advanced Education. The living allowance under the awards was increased for 1985 from $7 330 to $7 616.

- TAFE National Research and Development Centre Ltd.

The TAFE National Centre for Research and Development Ltd. was established jointly by the Commonwealth and the States as a company in South Australia and commenced operations in November 1981. Its members are the Commonwealth and State Education Ministers. A Board of Directors, consisting of TAFE administrators and business people, manages the company on behalf of the members. The purpose of the Centre is to stimulate and co-ordinate research and curriculum development in technical and further education throughout Australia.

1984-85 activities included in-house projects such as curriculum decision making in TAFE, computer-based educational software and courseware in TAFE, TAFE transition curriculum development and attrition in TAFE. Twenty-one in-house projects were undertaken in 1984-85. A significant proportion of the Centre's budget is allocated to providing grants to appropriate agencies for undertaking projects directly relevant to TAFE, eg curriculum implementations in TAFE, adult education in traditionally oriented Aboriginal communities, videotapes in external studies, monitoring technological change, computer assisted learning (CAL) in basic adult education.

A.10.2 COMMONWEALTH TERTIARY EDUCATION COMMISSION

The prime functions of the Commission under the Commonwealth Tertiary Education Commission Act 1977 are to advise the Minister on the necessity for, and the conditions and allocation of, financial assistance in respect of universities, colleges of advanced education and technical and further education institutions, and to administer approved policies and grants. The Act specifies that the commission is to perform its functions with the object of promoting:

- the balanced and coordinated development of the provision of tertiary education in Australia; and
- the diversifying of opportunities for tertiary education.

- Evaluations and Investigations Program

The Commission's Evaluations and Investigations Program seeks to:

- obtain information which will assist in future decision-making by the Commission and its Councils, State authorities and individual institutions;
- encourage the development of evaluative skills;
- promote a climate of critical self-assessment within institutions and authorities.

dies funded under the Program include investigatory studies conducted along the lines a research project and internal reviews, including reviews of administrative practices structures. Examples of the studies funded in 1984-85 and 1985-86 include educational lications of the mobility of tradespeople, a study of women's access to work through E, a review of law, an assessment of engineering, a review of funding arrangements in TAFE sector, and a review of efficiency and effectiveness in higher education titutions.

A.10.3 GRANTS TO UNIVERSITIES

Commonwealth Special Research Centres

982, ten Special Research Centres were established under the Commonwealth Program for notion of Excellence in Research. One of the Centres, the Nerve-Muscle Research Centre the University of New South Wales closed in 1984. Funding for the nine existing tres has been approved up to the end of 1987.

Other Grants

enditure on research and development in universities falls into three categories.

These are:

1 Funds specifically earmarked for research in the States grants legislation (known as Special Research Grants), together with other funds earmarked for research by the institutions themselves from recurrent and equipment grants provided under this legislation, or, in the case of the Australian National University, from its direct appropriation. These identifiable research expenditures are shown in the above table.

2 Funds specifically allocated to research activities but which are derived from sources other than those in Category 1 . It is assumed that the Commonwealth components of such funding; e.g. ARGC, NH&MRC, NERDDC; have been included as extramural expenditure by the departments and authorities concerned.

3 Expenditure on research activities which are funded from grants provided under the States grants legislation but which are part of the general teaching and research functions of the university. While the value of this research cannot be separately identified, an imputed value of $280m was estimated for 1981 in the 1981-82 Project SCORE Survey. If the 1981 proportion of imputed to total expenditure from all sources is applied to total expenditure from all sources in subsequent years, the imputed value of R&D in this category performed by universities would be approximately $310m in 1982, $330m in 1983, $360 million in 1984 and $390m in 1985. Comparable figures for earlier years are $220m in 1979 and $250m in 1980.

For colleges of advanced education the R&D reported to Project SCORE for 1981 was $9m which represented 1.5% of total Commonwealth grants to these bodies.

The imputed figures for R&D in Category 3 have not been included in the above table because they are based on subjective assessments and are thus subject to some degree of uncertainty.

Because financial accounting in universities is on a calendar year basis, the amounts sh in the above table are based on the following actual expenditures:

Table 16. Identifiable research expenditure in universities

Identifiable research expenditure	1979	1980	1981	1982	1983	1
	$m	$m	$m	$m	$ m	$
- from general funds	52.2	57.9	65.3	72.2	78.8	8
- special research grants	5.6	6.2	7.1	8.0	10.5	1
- from equipment grants	7.7	8.3	8.7	9.5	5.9	1
TOTAL	65.5	72.4	81.1	89.7	95.2	10

A.10.4 ACT SCHOOLS AUTHORITY

The research program of the ACT Schools Authority is aimed at improving the operation of schools and education in the ACT. Major areas of research and development were:

- Choice of Schools in the ACT - parents have their say,
- Quality of school life in ACT public schools,
- Teacher satisfaction.

A.10.5. COMMONWEALTH SCHOOLS COMMISSION

The Commission advises the Minister for Education on the needs of schools in Australia. In additon to its general funding programs the Commission has specific purpose programs designed to assist special target groups. From 1984-85, the Schools Commission has had responsibility for the curriculum development activities of the former Curriculum Development Branch of the Department of Education, originally established as the Curriculum Development Centre (CDC). The Centre was a national statutory body that work on school curricula in co-operation with educational authorities and agencies throughout Australia and overseas.

A.11 EMPLOYMENT AND INDUSTRIAL RELATIONS

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Commonwealth Budget sector net expenditure								
artment of Employment and Industrial Relations								
ustralian Standard Classification of Occupations	S(b)	0.619	-	-	-	-	0.236	0.312
	S(c)	0.018	-	-	-	-	-	0.005
ureau of Labour Market Research	S(a)	0.009	-	-	-	-	-	-
	S(b)	0.626	0.690	0.790	1.344	1.512	1.344	1.512
	S(c)	0.067	0.047	0.385	0.548	0.665	0.548	0.665
mployee Relations Program	S(b)	-	-	-	-	-	0.515	0.575
	S(c)	0.025	0.009	-	0.088	0.200	0.640	1.395
rant to National Safety Council	N(b)	-	-	-	-	-	0.050	0.450
	N(c)	-	-	-	0.168	2.500	0.338	2.670
hysical environment standards	S(b)	0.137	-	-	-	-	-	-
	N(b)	0.206	-	-	-	-	-	-
otal (Direct Commonwealth funding)		1.706	0.746	1.175	2.148	4.877	3.731	7.584

N Natural sciences and engineering
S Social sciences and humanities

(a) Intramural capital expenditure
(b) Intramural current expenditure
(c) Extramural expenditure

A.11.1 DEPARTMENT OF EMPLOYMENT AND INDUSTRIAL RELATIONS

Bureau of Labour Market Research

Bureau of Labour Market Research (BLMR) is the research arm of the Department of oyment and Industrial Relations.

Bureau undertakes research and analysis, sponsors research by other bodies and acts as learing house" for labour market research to ensure that advances in understanding are ly known and used. Senior staff are responsible for the design, implementation and semination of research. An Advisory Council oversights the work of the Bureau and ses the Minister for Employment and Industrial Relations on the Bureau's research ram and priorities. Its main objectives are:

- to contribute to improved labour market policies and program delivery,

- to promote the understanding of labour market operations through research into the labour market,

- through the conduct of extensive evaluation work, ensure programs are effective, viable, and address the needs of larger groups.

. Australian Standard Classification of Occupations (ASCO)

The Department of Employment and Industrial Relations and the Australian Bureau of Statistics jointly are developing a National Occupational Classification and Dictionary for use by the ABS, State and Commonwealth Government departments and authorities (including the Commonwealth Employment Service), universities, schools, and private industry for various purposes. ASCO will provide a systematic classification and description of occupations in the Australian labour market to assist:

- labour market analysis;
- development of training programs and labour force planning;
- improved manpower forecasting;
- accessibility to occupational information; and
- more efficient matching of job seekers and vacancies.

. Working Environment Branch

The aim of the Working Environment Branch is to promote the spread of Industrial Democrac Employee Participation. It advises the Government with regard to these issues and provides Secretarial support to the NLCC Committee on Employee Participation. Industrial Democracy Grants were made in relation to a variety of activities relating to the development of the Green Paper on Industrial Democracy, and the sub-programs including th EP/ID Cost Subsidisation Program, Research Grant Scheme, and ID/EP Resource Persons Development Program. The overall objective of the Industrial Democracy Grants Program is to contribute to the solution of some of the basic problems which hinder a sustained development of employee participation and industrial democracy.

. National Safety Council of Australia

The National Safety Council of Australia aims to encourage, and work for, the spread of safety awareness and safety practices throughout Australia by providing an authoritiative source of information, opinion and advice to industry, unions, Governments, media and the community. Objectives of the National Occupational Health and Safety Commission (NOHSC) Research Grants Scheme are:

- to fund and generally support high quality research in the field of occupational health and safety according to a developed list of appropriate priorities;

- to improve the quality of occupational health and safety research in Australia and strengthen Australian research capability;

- to promote cooperation and liaison between the Commonwealth, the States, academi institutions and the private sector in occupational health and safety research; and

- consistent with the functions of the National Occupational Health and Safety Commission, to support research which would lead to an improvement in the health safety and welfare of people at work.

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Commonwealth Budget sector net expenditure								
partment of Foreign Affairs								
Bilateral Agreements	N(c)	-	-	-	0.019	0.013	0.127	0.095
	S(c)	-	-	-	0.019	0.013	0.127	0.095
Economic Studies	S(c)	0.172	0.332	0.332	0.372	0.372	0.372	0.372
Multilateral Grants	N(c)	0.011	0.012	0.012	-	-	0.647	0.877
	S(c)	0.030	0.034	0.033	0.038	0.048	0.038	0.048
stralian Centre for International Agricultural Research (ACIAR)	N(b)	-	-	-	-	-	0.973	1.170
	N(c)	-	0.960	4.750	8.617	11.000	9.189	11.070
	S(c)	-	-	-	-	-	0.266	0.500
stralian Development Assistance Bureau (ADAB)								
Administration	N(a)	-	-	-	-	-	0.039	0.055
	N(b)	-	-	-	-	-	1.902	2.394
	S(a)	-	-	-	-	-	0.011	0.014
	S(b)	-	-	-	-	-	0.524	0.620
ASEAN Australian Economic Cooperation Program (AAECP)	N(c)	2.790	5.265	4.271	4.492	4.294	7.230	7.165
	S(c)	1.856	1.939	1.710	2.232	0.900	4.118	1.875
Bilateral Aid - South East Asia and Pacific Region	N(c)	5.525	6.406	6.680	7.631	8.867	47.433	50.691
	S(c)	0.073	0.088	0.487	0.634	0.982	5.329	4.070
Bilateral Aid - n.e.i.	N(c)	0.412	0.856	1.067	0.707	0.625	11.445	13.184
	S(c)	-	-	-	0.008	0.065	0.604	0.809
Multilateral Programs	N(c)	-	-	-	-	-	14.441	11.092
	S(c)	-	-	-	-	-	1.552	0.950
Development Training	N(c)	2.065	3.135	1.481	2.220	2.982	22.845	25.658
	S(c)	1.300	2.121	1.504	1.593	1.675	14.388	14.210
International Science, Technology and Research Programs	N(c)	4.717	6.436	6.271	7.830	7.694	8.157	8.000
Co-financing with International Financial Institutions	N(c)	-	-	1.121	1.079	0.840	19.631	20.107
	S(c)	0.050	0.055	0.511	0.528	0.555	6.538	6.805
Non Government Organisations	N(c)	0.085	0.207	0.258	0.208	0.208	0.598	0.638
	S(c)	0.075	0.182	0.233	0.182	0.182	0.308	0.308
Regional Programs and Organisations	N(c)	0.038	-	0.005	0.005	0.014	8.097	8.151
	S(c)	0.009	0.016	0.011	0.007	-	0.915	0.679

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
. Scientific and Technological Aid	N(c)	0.729	1.950	2.023	1.834	1.809	4.529	5.088
	S(c)	0.093	0.093	0.088	0.161	0.214	0.429	0.506
Total (Budget Sector)		20.031	30.085	32.848	40.414	43.350	192.798	197.296
B. Commonwealth Non-Budget Sector								
Australian Centre for International Agricultural Research (ACIAR)	N(c)	-	-	-	-	0.521	-	0.525
	S(c)	-	-	-	-	-	-	0.373
Total (Non-Budget Sector)		-	-	-	-	0.521	-	0.898
Total (Direct Commonwealth Funding)		20.031	30.085	32.848	40.414	43.870	192.798	198.194

N Natural sciences and engineering
S Social sciences and humanities

(a) Intramural capital expenditure
(b) Intramural current expediture
(c) Extramural expenditure

A.12.1 DEPARTMENT OF FOREIGN AFFAIRS

. Bilateral Agreements

The Department of Foreign Affairs supports scientific and technological exchanges with China through a number of individual grants-in-aid, mostly for reciprocal visits by scientists and experts.

Such grants are channelled through the Australia-China Council (ACC) and are mainly concerned with projects that have emerged from the Academy of Science's exchange program, or which involved government departments, universities, or private institutions. The Council acts as a focus for information dissemination, commissions research work and promotes Chinese studies in Australia.

. Multilateral Grants

Australia contributes to the funding of certain international organisations which undertake S&T activities. The expenditure shown in the table above includes contributions to specific programs of the International Atomic gy Agency, the Food and Agriculture Organisation and the Organisation for Economic eration and Development which can be identified as falling within the scope of this ement. In addition, Foreign Affairs matches the contribution of the Department of ation (A.10.1) to the Centre for Educational Research and Innovation (CERI), and also ributes to the United Nations Environment Program (UNEP), to the Convention on the ervation of Antarctic and Marine Living Resources, and to the Secretariat to the ral and Energy Forum of the Pacific Economic Cooperation Conference.

Economic Studies

Australia/Japan and Western Pacific Economic Relations Project is funded by both ralia and Japan and coordinates research by Australia and Japan on economic relations een the two countries. Support is also given to the Indonesia Project at the ralian National University to carry out research on Indonesian economic affairs. The t to the Australian Studies Centre in London is also included here.

A.12.2 AUSTRALIAN DEVELOPMENT ASSISTANCE BUREAU (ADAB)

ralia's development assistance program is a major focus of our relations with many d World countries. This program has given increasing priority to science and nology. New avenues outside the scope of the traditional aid framework have been ituted to strengthen scientific and technical institutions in developing countries.

ASEAN Australian Economic Co-Operation Program (AAECP)

AAECP facilitates ASEAN regional co-operation by assisting projects of regional rtance jointly conducted by member countries of ASEAN. This has stimulated research development work, technology transfer, and has laid the foundation for further peration among ASEAN countries. Australia has established close contact with the N Committee on S&T (COST) through five ongoing R&D projects in the food technology and gy areas. There are also others in the pipeline in the fields of marine science, ning research and development management, diabetes research and food habits.

Bilateral Aid Projects

e projects are undertaken in response to requests from developing countries and many hem have a substantial scientific component or draw heavily on scientific knowledge or rtise. It is Australia's aim to use these projects to build up the development city of developing countries so there is a strong emphasis on technology transfer ugh the provision of experts, equipment and training associated with the projects. than one half of the aid aims at agricultural development. Other fields of ificance are: civil and resource engineering, natural resources and the environment, gy, administration and business, food technology, health and education.

Multilateral Programs

nisations receiving funding include the United Nations Development Program which is largest multilateral funding agency for technical assistance, the United Nations Fund Population Activities which assists countries to be aware of the social, economic and ronmental implications of population problems and the Commonwealth Fund for Technical eration which provides technical assistance to the developing countries of the nwealth in fields such as finance, statistics, development planning, project uation and preparation, public administration and taxation.

- Development Training

Training assistance enables Australia to assist in the development of skilled manpower resources in developing countries. The governments of developing countries decide how they will use the training allocation provided under the aid program.

Training can be offered to meet special needs. For example, within Australia funds are spent to enable Australian educational institutions to run Australian Development Assistance Courses (ADACS). These courses may be intensive practical or formal postgraduate programs. In addition, governments may nominate candidates to attend regular courses at Australian tertiary institutions.

While the emphasis of the program is on training in Australia, awards are also made available for study at institutions in the Pacific and South East Asian regions.

- International Science, Technology and Research Programs

Support is provided for the core budgets and special projects of international and regional research programs. Institutes supported include the International Agricultural Research Institutes of the Consultative Group on International Agricultural Research (CGIAR) and other research institutes.

- Co-financing with International Financial Institutions

The co-financing facility which began in 1982-83 provides funds in co-operation with the World Bank for financing and implementing development projects. In consultation with the World Bank a program in the Asia/Pacific region has been developed which concentrates on project preparation studies. Funds are evenly shared by: urban development, energy, water supply and administration and business.

- Non-Government Organisations

Non-government organisations, operating mainly through channels outside the official aid program, effectively complement the Government's program. Government assistance is provided for the International Union for the Scientific Study of Population, the Population Council, the International Foundation for Science and the Association of Geoscientists for International Development.

- Regional Programs and Organisations

This program provides funds for institutional and program support and fellowship grants for regional organisations and programs in the Asian and Pacific regions. Institutes and Centres receiving support include the Economic and Social Commission for Asia and Pacific (ESCAP), the International Atomic Energy Agency (IAEA), the World Health Organisation (WHO), the South Pacific Commission (SPC) and others.

- Scientific and Technological Aid

Programs funded include the International Seminars Support Scheme, the International Development Program support for the South East Asian Ministers for Education Organisation (SEAMEO) and support for regional centres and projects. Activities currently supported under these programs include language training; tropical biology, medicine and public health; educational innovation and technology; education in science and mathematics, and graduate study and research in agriculture.

A.12.3 AUSTRALIAN CENTRE FOR INTERNATIONAL AGRICULTURE RESEARCH (ACIAR)

e ACIAR was established by an Act of the Australian Parliament which came into effect in ne 1982. The Centre is designed to encourage research aimed at identifying agricultural oblems in developing countries and at finding solutions to such problems.

is clear that Australia can assist in problems in crop and pasture legumes and areas ch as biological nitrogen fixation, animal health and nutrition, plant protection, soil d water management, plant nutrition, agro-climatology, post-harvest technology and cio-economic analysis. ACIAR has developed projects covering some of these areas. The search is contracted to Australian research institutions and other suitably qualified oups in collaboration with developing country scientists whenever possible.

A.13 HEALTH

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Health								
. Australian Radiation Laboratory	N(a)	0.190	0.510	0.220	0.212	0.247	0.354	0.412
	N(b)	1.915	2.265	2.191	2.367	2.387	3.945	3.979
. Building grants to W. & E. Hall Institute	N(c)	2.170	3.211	3.538	6.257	8.013	6.257	8.013
. School of Public Health and Tropical Medicine	N(a)	0.150	0.100	0.187	0.237	0.137	0.237	0.137
	N(b)	1.914	2.265	2.434	2.779	3.094	4.147	4.528
. Australian Institute of Health Health Services R&D Research Grants Program	N(c)	0.218	0.293	0.313	1.379	1.418	1.600	1.645
. National Acoustics Laboratories	$_{s}$N(a)	0.700	1.232	2.014	0.929	1.085	2.975	3.417
	$_{s}$N(b)	0.645	0.652	0.853	0.853	1.137	2.353	3.006
. National Biological Standards Laboratory	N(a)	0.046	0.241	0.415	0.567	0.652	0.840	0.836
	N(b)	2.220	2.450	2.721	2.985	3.330	6.352	7.085
	N(c)	-	-	-	-	-	0.027	0.028
. National Health and Medical Research Council	N(c)	25.648	29.557	37.979	44.182	50.781	44.182	50.781
. Pathology Laboratories	N(a)	-	-	-	-	-	1.170	1.000
	N(b)	-	-	-	-	-	15.517	16.376
. Ultrasonics Institute	N(a)	0.047	0.094	0.116	0.148	0.175	0.296	0.350
	N(b)	0.308	0.341	0.378	0.404	0.430	0.808	0.860
. Other#	N(a)	0.002	-	-	-	-	-	-
	N(b)	0.162	-	-	-	-	0.193	0.517
	$_{s}$N(c)	0.246	0.475	0.493	0.077	1.158	0.144	1.170
ACT Health Authority	$_{s}$N(b)	0.004	-	0.156	-	-	0.03&	0.03&
Commonwealth Serum Laboratories	N(a)	0.078	0.078	0.108	0.098	0.098	0.10&	0.11&
	N(b)	1.359	2.222	1.933	2.497	2.502	2.68&	2.69&
	N(c)	0.224	0.220	0.135	-	-	-	-
Total (Budget Sector)		38.246	46.206	56.184	65.971	76.644	94.220	106.972

($ million)		R&D					S&T (including R&D)	
						Projected	Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Commonwealth Non-Budget sector								
artment of Health								
Other	N(b)	-	-	-	-	-	-	0.003
mmonwealth Serum Laboratories(BE)	N(a)	0.132	0.092	0.183	0.13&	0.13&	0.16&	0.16&
	N(b)	2.297	2.608	3.275	3.49&	3.49&	3.95&	3.95&
Total (Non-budget Sector)		2.429	2.699	3.458	3.629	3.635	4.118	4.118
Total (Direct Commonwealth funding, including BE)		40.675	48.905	59.642	69.601	80.279	98.338	111.090
Expenditure from other sources								
artment of Health								
Commonwealth Institute of Health	N(a)	-	-	-	-	0.183	-	0.183
	N(b)	-	-	-	-	4.017	-	4.017
Other#	N(a)	0.001	-	-	-	-	-	-
	N(b)	0.032	-	-	-	-	-	-
Health Authority	N(a)	-	0.001	-	-	-	-	-
	sN(b)	0.164	0.110	0.193	0.191	0.191	0.19&	0.19&
Total (Other sources)		0.196	0.111	0.193	0.191	4.391	0.191	4.391
Total (A+B+C)		40.871	49.017	59.835	69.792	84.670	98.529	115.481

N	Natural sciences and engineering	S	Social sciences and humanities
sN	Includes small proportion of social sciences and humanities		
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure	&	DoS estimates

# "Other" covers R&D expenditure by the Dental Health Unit, Institute of Child Health, Health Facilities Branch, Family Planning Program, National Diseases Control, Health Technology Advisory Committee, Porelaboratory Pathology Testing, etc.

A.13.1 DEPARTMENT OF HEALTH

- Australian Radiation Laboratory (ARL)

ARL undertakes research and development mostly in radiation physics and chemistry relating to the public and occupational health implications of the uses of ionising radiation, radioactive materials, non-ionising radiation, and of uranium mining and milling and of levels of radioactivity in the Australian environment. During 1984-85 the Laboratory performed R&D on:

- national standards of ionising radiation dose,
- national standards of radioactivity and dose levels from radioactivity,
- public health hazards, dose levels and national standards of radiation dose in relation to uranium and thorium mining,
- physical aspects of radioactive materials in medical diagnosis or treatment,
- public health hazards due to microwaves and on dose levels from sources of microwaves,
- lasers and ultraviolet in relation to public health hazards, dose levels, use in medicine and on the establishment of standards,
- dose levels from sources of ionising radiation and on standards of radiation dose,
- public health hazards of ionising radiation.

The Laboratory prepared and reviewed Codes of Practice, safety standards and guidelines relating to radiation health including the preparation and dissemination of technical hand books.

The Laboratory continued to operate a National Personal Monitoring Service for occupationally exposed employees.

The Laboratory gave considerable technical and scientific support to the Royal Commission into Atomic Weapon Testing in Australia.

- School of Public Health and Tropical Medicine

The School, located in the Sydney University campus, has taken over a large part of the functions of the Commonwealth Institute of Health. (The National Occupational Health and Safety Commission (A.11.1) has taken over the Occupational Health Section of the former CIH). The School conducts studies and research into the health status of the Australian population, the effective and efficient use of health services, and into tropical medicine. In addition to its own appropriation, the School receives research grants from various Government sources.

- National Acoustics Laboratories (NAL)

NAL undertakes research and development in respect of hearing aids and their application to the needs of individuals, and in respect of problems of noise as it affects individuals. Projects underway include the investigation of auditory processing problems in children, techniques for the selection, fitting, evaluation and development of hearing aids and methods of rehabilitation of deaf people, and studies of the physiological and sociological effects of noise.

construction of a new Laboratory building has resulted in a substantial increase in tal expenditure.

National Biological Standards Laboratory (NBSL)

NBSL is the laboratory arm of a national system of therapeutic goods control jointly nistered by Commonwealth and State authorities.

as the responsibility to develop standards, tests and other measures to ensure that epeutic goods for human and veterinary use are of good quality, safe and effective, by uating new therapeutic goods prior to marketing; testing therapeutic goods on the et for compliance with standards; investigating failures and complaints and by ecting manufacturing practices.

National Health and Medical Research Council (NH&MRC)

NH&MRC is an independent body which advises the Minister for Health on the application unds from the Medical Research Endowment Fund. The Fund provides assistance to nwealth and State Governments engaged in medical research, to universities and other tutions for the purpose of medical research, and to persons engaged in medical rch and in the training of persons in medical research. NH&MRC grants form the major ortion of the total Commonwealth funds spent on medical research in Australia.

ustralian Institute of Health Research Grants Programs

ustralian Institute of Health was established in 1984-85 to provide a national focus ealth services research and planning. The purpose of the grants is to improve, gh research and demonstration, the technique and practice of administration, ation, planning and delivery of health care in Australia and also to provide mation which will assist the development of health services policy.

ltrasonics Institute

ltrasonics Institute carries out research on the development of instrumentation and iques for the application of ultrasonic sound waves in medicine. Researchers from nstitute engage in clinical research and development of instrumentation and iques and work in close cooperation with a number of clinical collaborators. They maintained a pre-eminent international position in ultrasonic imaging. Recent opments include a pulsed Doppler blood flow measurement system which provides the quantitative non-invasive measurement of blood flow in the deep lying abdominal and vessels. The most recent new departure is the propagation of sound waves within the which may be used to assess the mechanical properties of the tissues through which ound passes and hence the pathological state of the tissues. A new ultrasonic er specifically designed for ultrasonic tissue characterisation has been developed at nstitute and is currently under clinical evaluation. The Institute holds a total of atents on 23 inventions in various countries.

amily Planning Program

are provided under the Family Planning Program to encourage research into social, al and demographic aspects of family planning, as one means of advancing the edge and practice of family planning to improve the health and quality of life of the nity.

- National Diseases Control Program

A component of the National Diseases Control Program provides funds for research into insect vectors and vector borne pathogens responsible for disease such as dengue fever, malaria, Australian encephelitis, and Ross River Virus infections.

- National Health Technology Advisory Panel

The objective of the National Health Technology Advisory Panel is to provide advice to the Commonwealth Government on the impact and cost effectiveness of new and existing health technologies. The Panel has published reports on Nuclear Magnetic Resonance Imaging (NMRI), Medical Cyclotron Facilities, In-Viro NMR Spectroscopy, and Shock Wave Lithotripsy. The NMRI Technical Committee of the Panel is developing a program for the evaluation of NMRI in 5 Australian hospitals.

- Pathology Laboratories

The Commonwealth Pathology Laboratories plan and coordinate the operation of the Australian Government Pathology Laboratory Service. Pathology laboratories are located in 5 states. They provide diagnostic services to hospitals and the medical profession in their respective regional areas.

- Paralaboratory Pathology Testing Committee

The terms of reference of the committee are to monitor and report on progress achieved by the National Health Technology Advisory Panel (NHTAP - see above) and the National Pathology Accreditation Advisory Council (NPAAC) in relation to paralaboratory pathology testing.

- Drugs of Dependency Branch

R&D activities of the Branch are: to provide research into drug abuse; to develop research skills; to evaluate existing programs; development and evaluation of new programs and such other specific research projects as appear from time to time to be needed (eg National Campaign Against Drug Abuse Strategy Document P.8 - endorsed by all Commonwealth, State and Territory Governments).

- Dental Health Unit

The Science and Technology activities of the Unit are:

- Continuing assessment of dental health of children as part of the determination of the dental health of the general community; this is used for long term planning. The results are of significance nationally and internationally.

- Listing of individual communities (and their populations) using water containing significant levels of fluoride either naturally or added. This is important in the field of preventive dentistry.

A.13.2 ACT HEALTH AUTHORITY

The ACT Health Authority is responsible for the provision of public health services in the ACT. This covers a wide range of hospital and laboratory services, and community services such as public health surveillance, child and maternal health, mental health, comprehensive geriatric and rehabilitation services, transport (including mbulance services), home nursing, health education etc. The three public hospitals in he ACT work co-operatively to provide a range of medical specialist services for esidents of the ACT and its surrounds and visitors to the national capital.

A.13.3 THE COMMONWEALTH SERUM LABORATORIES (CSL)

he Commonwealth Serum Laboratories undertake research and development of therapeutic and iagnostic products for human and animal use. Many of the products developed by CSL are esigned for and are unique to Australia.

A.14 HOUSING AND CONSTRUCTION

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Housing and Construction								
. Central Investigation and Research Laboratories	N(a)	0.122	0.130	0.110	0.22&	0.09&	0.49&	0.14&
	N(b)	0.978	1.020	0.880	0.93&	0.93&	2.06&	2.07&
. Contributions to								
- Australian Housing Research Council	N(c)	0.058	0.078	0.049	0.10&	0.10&	0.10&	0.10&
- Australian Uniform Building Regulations Coordinating Council	N(c)	0.028	0.012	0.050	0.026	0.075	0.026	0.075
. Building Technology Centre	N(a)	0.094	0.053	0.049	0.101	0.281	0.151	0.359
	N(b)	0.681	0.811	0.966	0.854	1.169	1.751	2.451
Snowy Mountains Engineering Corporation (SMEC)	N(a)	-	-	-	-	-	0.009	-
	N(b)	-	-	-	-	-	1.991	-
Total (Budget Sector)		1.961	2.104	2.104	2.236	2.653	6.581	5.200
B. Commonwealth Non-Budget sector								
Department of Housing and Construction								
. Attributed to past Commonwealth Contributions:								
- Australian Housing Research Council	N(c)	0.038	0.055	0.019	0.03&	-	0.03&	-
- Australian Uniform Building Regulations Coordinating Council	N(c)	0.011	0.007	-	-	0.252	-	0.252
. Building Technology Centre	N(a)	-	-	-	0.024	0.049	0.026	0.051
	N(b)	-	-	-	0.206	0.201	0.234	0.239
Snowy Mountains Engineering Corporation (SMEC) BE	N(a)	-	-	-	-	-	0.275	0.900
	N(b)	-	-	-	-	-	64.535	50.075
Total (Non-Budget sector)		0.049	0.062	0.019	0.267	0.502	65.107	51.517

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Total (Direct Commonwealth funding, including BE)		2.010	2.166	2.122	2.503	3.155	71.688	56.717
Total (Direct Commonwealth funding, excluding BE)		2.010	2.166	2.122	2.503	3.155	6.878	5.742
Expenditure from other sources								
artment of Housing and Construction								
National Building Technology Centre	N(a)	0.035	0.014	0.012	-	-	-	-
	N(b)	0.255	0.217	0.238	-	-	-	-
Attributed to State Contribution:								
- Australian Housing Research Council	N(c)	0.092	0.127	0.068	0.10&	0.10&	0.10&	0.10&
- Australian Uniform Building Regulations Coordinating Council	N(c)	0.039	0.019	0.018	0.026	0.075	0.026	0.075
Total (Other sources)		0.421	0.376	0.336	0.126	0.175	0.126	0.175
Total (A+B+C)		2.431	2.542	2.458	2.629	3.330	71.814	56.892

N Natural sciences and engineering
S Social sciences and humanities

(a) Intramural capital expenditure
(b) Intramural current expenditure
(c) Extramural expenditure
& DoS estimates

BE wholly Commonwealth-owned business enterprise.

A.14.1 DEPARTMENT OF HOUSING AND CONSTRUCTION

Department has responsibility for the planning, execution and maintenance of monwealth Government works. In support of these operations, the Department carries out lied research and laboratory testing and provides a comprehensive range of technical vices. In many cases these services also directly or indirectly benefit the needs of ustry, and the Department contributes to the development of national standards, lding regulations and other public interest activities requiring research and other hnical services.

- Australian Uniform Building Regulations Coordinating Council (AUBRCC)

AUBRCC is responsible for the further development of the Australian Model Uniform Buildin Code as the technical basis for building control in Australian States and Territories. Several research activities are currently being funded by the Council.

- Australian Housing Research Council (AHRC)

The AHRC comprises Commonwealth, State and Territory Ministers with responsibility for public housing authorities. Its principal objectives are to provide for research into economic and social problems in housing, dissemination of research results, promotion of collaborative research and the coordination of research, and where necessary to complemen research conducted elsewhere.

- Central Investigation and Research Laboratory (CIRL)

CIRL conducts applied research directly concerned with design and construction of departmental projects. Topics include natural and processed materials, building products processes and systems and operating and environmental conditions.

- National Building Technology Centre

The Centre, formerly known as the Experimental Building Station (EBS) is responsible for the development of safe, durable and cost-effective building systems, and building restoration systems.

Research projects in 1984-85 and 1985-86 include, among others: studies on the strength of masonry walling; the fire resistance of elements of vertical and horizontal construction; the fire properties of furnishing, finishes and linings; participation in international fire research projects; control of smokes and hot gases; the fire protection of openings; timber in the fire context; the spread of fire in buildings; the fire properties of non-combustible structural materials; sound transmission; energy in buildings; evaluation of the past-occupancy performance of buildings; preservation o buildings; interior finishes; and work for the Australian Uniform Building Coordinating Council (see above), States, Territories and various Authorities.

A.14.2 SNOWY MOUNTAINS ENGINEERING CORPORATION

The Snowy Mountains Engineering Corporation is a Commonwealth Government Authority providing specialist engineering consulting services on a commercial basis to government and private organisations both within Australia and overseas.

The fields of practice, stemming from the Corporation's origins in water and power engineering, cover many supportive activities which include civil, electrical and mechanical engineering, road engineering, hydrology and hydraulics, geology and soil and rock mechanics, surveying, estimating, contract supervision, irrigation, agriculture, economics, training, equipment procurement and project management.

The Corporation has also developed special expertise in the areas of hydrology, fluid mechanics and geomechanics and has well established fluid mechanics and geomechanics laboratories.

While continuing to undertake significant work in Australia, the Corporation has become increasingly committed to assisting with engineering development programs in developing countries and by far the largest part of the work is now performed overseas, often throug ADAB (A12.2) funding.

A.15 IMMIGRATION AND ETHNIC AFFAIRS

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Commonwealth Budget sector net expenditure								
partment of Immigration and Ethnic Affairs								
Studies and Research	S(b)	0.117	0.199	0.038	0.097	0.089	0.587	0.604
	S(c)	0.263	0.234	0.140	0.225	0.225	0.442	0.419
stralian Institute of ulticultural Affairs	S(a)	-	-	-	-	-	0.672	0.048
	S(b)	-	-	-	-	-	1.905	1.694
	S(c)	-	-	-	-	-	0.573	0.241
Total (Budget sector)		0.381	0.432	0.177	0.322	0.314	4.179	3.006
Commonwealth Non-budget sector								
artment of Immigration and Ethnic Affairs								
Studies and Research - Attributable to past Commonwealth contributions	S(c)	0.006	0.021	-	-	-	0.047	0.064
tralian Institute of ulticultural Affairs	S(a)	-	-	-	-	-	0.003	-
	S(b)	-	-	-	-	-	0.009	0.010
Total (Non-Budget sector)		0.006	0.021	-	-	-	0.059	0.074
Total (Direct Commonwealth funding)		0.386	0.453	0.177	0.322	0.314	4.238	3.081
Expenditure from other sources								
artment of Immigration and Ethnic Affairs								
Studies and Research - Attributable to State contributions	S(c)	0.012	0.034	-	-	-	-	-
Total (Other sources)		0.012	0.034	-	-	-	-	-
Total (A+B+C)		0.398	0.487	0.177	0.322	0.314	4.238	3.081

N Natural sciences and engineering
S Social sciences and humanities

(a) Intramural capital expenditure
(b) Intramural current expenditure
(c) Extramural expenditure

A.15.1 DEPARTMENT OF IMMIGRATION AND ETHNIC AFFAIRS

The Department of Immigration and Ethnic Affairs (DIEA) develops, undertakes and oversights research projects designed to enhance departmental awareness on migrant and population issues and assist it in developing policies in the area of migration and settlement. The main focus of the 1985-86 research program is on the labour market experience/impact of selected migrant categories.

Activities are directed mainly towards monitoring and examining the impact of migrants in the labour market and (in 1984-85) with macro-economic modelling work to assess the overall impact on the economy.

A joint project on the economics of immigration, funded equally by DIEA and the Committee for Economic Development of Australia (CEDA) concluded in 1984-85.

Research into English Language needs of immigrants is directed to:

- Improving the structure and content of ESL (English as a Second Language) learning arrangements;
- Monitoring and evaluating the effectiveness of the Adult Migrant Education Program (AMEP); and
- Providing a computer-based model to estimate potential future demand for the AMEP.

The Australian Population and Migration Research Program Trust Account, jointly funded by the Commonwealth and States, supports studies undertaken to gain a better understanding of the particular categories of immigrants entering Australia. Projects for 1984-85 included: an ongoing study of internal migration of the Australian population, and a study of language services required and available to non-English speaking people in Australia.

A.15.2 AUSTRALIAN INSTITUTE OF MULTICULTURAL AFFAIRS

The Institute is a Commonwealth statutory authority established by legislation in 1979. The Australian Institute of Multicultural Affairs Act, amended in 1985, prescribes that the objects of the Institute are (in summary) to develop among the members of the Australian community an awareness of the diverse cultures within that community and an appreciation of the contributions of those cultures; to promote tolerance, understanding, harmonious relations and mutual esteem among the different cultural groups and ethnic communities in Australia; and to promote a cohesive, just and equitable Australian society.

It seeks to achieve these objects inter alia by: providing advice to the Commonwealth Government; promoting and conducting community educational activities; commissioning and conducting research; collecting and disseminating information; liaising with, and promoting the coordination of the activities of Commonwealth and State departments and agencies, community groups and other relevant organisations.

ince it commenced activities in 1980 the Institute has undertaken a number of major rojects, culminating in the publication of reports to Government, on migrant and ulticultural education; post-arrival programs services; employment and training rograms as they affect migrant and refugee youth; and the situation of migrant aged. urrent research areas include issues relating to migrants in the labour force; social obility; multicultural television, and community relations.

he Institute's major community education and information activities have been the roduction and dissemination of film and printed material on the experience of migrants nd ethnic communities in Australia, and the impact of migration on Australia. The aterial has been variously aimed at policy-makers, researchers, professionals in relevant ields, teachers and students, and to the community at large.

ollowing review of the Institute's activities in 1983/84, the Commonwealth Government mended its objects and functions with a view to giving the organisation a broader, more isible role, with greater emphasis on community education and information activities.

A.16 INDUSTRY, TECHNOLOGY AND COMMERCE

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Industry, Technology and Commerce								
. Bureau of Industry Economics	S(b)	1.454	1.521	1.918	2.197	2.396	2.197	2.396
	S(c)	0.093	0.099	-	-	-	0.040	0.040
. Administrative and other costs of technology programs, not elsewhere included	N(b)	-	-	-	-	-	3.916	4.122
. Commercial Development of Technology								
- Interscan support	N(c)	2.068	2.194	2.528	-	-	-	-
- Public Interest Projects	N(b)	-	-	-	-	-	0.964	1.029
	N(c)	-	-	-	-	-	9.822	10.000
. Grant-in-aid to								
- Industrial Design Council	N(c)	-	-	-	-	-	0.190	0.203
- National Association of Testing Authorities	N(c)	-	-	-	-	-	0.860	0.918
- Research Associations	N(c)	1.209	1.341	1.680	1.900	2.030	1.900	2.030
- Standards Association	N(c)	-	-	-	-	-	2.760	2.947
. Industrial R&D Grants								
- Commencement Grants	N(c)	9.700	13.075	14.558	16.262	17.400	16.262	17.400
- Project Grants	N(c)	12.053	34.797	43.243	38.126	38.022	38.126	38.022
- Automotive Industry Design Assistance Grants	N(c)	-	-	-	-	-	-	35.00&
. Technology Development								
- Assistance to inventors	N(b)	-	-	-	-	-	0.132	0.165
	N(c)	-	-	-	-	-	0.645	0.250
- Technological innovation programs	N(b)	-	-	-	-	-	0.892	1.275
	N(c)	-	-	-	-	-	2.304	2.600
. Technology Transfer Council	N(c)	-	-	-	-	-	0.980	1.046
. Biotechnology Grants	N(b)	-	-	-	-	-	0.035	0.037
	N(c)	-	-	0.720	2.140	3.296	2.140	3.296
. Materials handling	N(a)	-	-	-	-	-	0.181	1.095
	N(b)	-	-	-	-	-	1.391	1.728

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Australian Productivity Council (admin support)	N(b)	0.012	-	-	-	-	-	-
	N(c)	0.016	-	-	-	-	1.500	1.600
ustries Assistance Commission IMPACT Project	S(b)	0.257	0.108	0.090	0.138	0.142	0.138	0.142
	S(c)	-	0.082	0.090	0.099	0.100	0.099	0.100
Total (Budget sector)		26.861	53.217	64.827	60.862	63.386	87.474	127.441
Commonwealth Non-Budget Sector								
artment of Industry, Technology nd Commerce								
Materials handling	N(a)	-	-	-	-	-	0.001	0.006
	N(b)	-	-	-	-	-	0.030	0.029
Total (Non-Budget Sector)		-	-	-	-	-	0.031	0.035
Total (Direct Commonwealth funding)		26.861	53.217	64.827	60.862	63.386	87.505	127.475
Expenditure from other sources								
artment of Industry, Technology nd Commerce								
Materials handling	N(a)	-	-	-	-	-	0.004	-
	N(b)	-	-	-	-	-	0.116	-
Productivity Promotion Council (admin.	S(b)	0.010	-	-	-	-	-	-
support - industry contribution)	S(c)	0.010	-	-	-	-	-	-
Total (Other sources)		0.020	-	-	-	-	0.120	-
Total (A+B+C)		26.881	53.217	64.827	60.862	63.386	87.625	127.475

N Natural sciences and engineering

S Social sciences and humanities

(a) Intramural capital expenditure

(b) Intramural current expenditure

& DoS estimates

A.16.1 DEPARTMENT OF INDUSTRY, TECHNOLOGY AND COMMERCE

. Bureau of Industry Economics (BIE)

The BIE is a major centre for research into the manufacturing and commerce sectors. The major objectives are to:

- carry out research work needed to assist the Government in the formation of industrial policy;
- assist the Industries Assistance Commission and other government bodies by making submissions on the results of research;
- attract a high standard of professional staff and publish its results; and
- complement the work of other research agencies and cooperate with universities and colleges in developing research programs.

Areas for research are selected after consideration of the importance of the issues involved and consultation with the BIE Council of Advice. Investigations into several areas are underway. These include:

- aerospace industry in Australia;
- economic aspects of industry regulation;
- evaluation of public interest R&D Projects and Research Associations;
- import pricing and Australian industry;
- factors inhibiting growth in Australian manufacturing;
- non-ferrous basic metals pricing;
- existence of high technology industries; and
- small business.

. Commercial Development of Technology

Major programs have been aimed at the commercial development of Australian technology.

- Interscan (Australian Microwave Landing System (MLS)). The commercial development phase of the MLS program was completed in 1983-84.

- Public Interest Projects. Proposals for assistance under Section 39 of the ndustrial Research and Development Incentives Act 1976 are considered in the light of the vernment's desire that public interest projects should:

- be of high priority in terms of Government policy objectives;
- have substantial social and economic benefit to the community;
- be of major importance and likely to command widespread public support;
- normally involve the commercial development of the results of research done in the public sector or by non-profit research institutions; and
- not be funded in place of other funding sources.

ly proposals which are of outstanding merit and which meet the above criteria are ovided with financial support by the Government. Projects funded under the scheme have ncluded:

- development of a sythetic human growth hormone by biological means to overcome a serious shortfall in the supply of natural growth hormone;
- development of analytical techniques using tunable lasers to monitor important constituents of gas steams;
- development and dissemination of a new generation of computer-aided-design-(CAD) tools for the design of large-scale and very large-scale integrated circuits for microelectronic applications;
- development of appropriate technology and necessary infrastructure to establish an Australian industry to produce and commercialise a range of algal and related products obtained from selected organisms; and
- the establishment by Australian Optical Fibre Research Pty Ltd (AOFR), a Wormald subsidiary, of a research and development facility to produce prototype optical fibre based sensors.

Grants-in-Aid

e Department is the channel for government support to the Industrial Design Council of stralia, the Standards Association of Australia, the National Association of Testing thorities and various Research Associations. The Industrial Design Council of Australia DCA) provides resources and conducts seminars and workshops to assist improvement in the sign of manufactured products and to foster design awareness in industry and the mmunity. IDCA is becoming involved in new product development initiatives aimed at creasing international competitiveness of Australian manufacturing industry. The monies ovided by the Department assist in the running of the IDCA national office and for ecific national programs. The grant to the Standards Association is a contribution wards its administrative costs in recognition of the Associations's role in preparing d publishing Australian Standards and to promoting the general adoption of standards lating to structures, commodities, materials, practices, and operations and other tters. The grant to the National Association of Testing Authorities is in recognition the important support provided by NATA to the government, industry and the community at rge, including the technology-based industries through the provision of an independent tional laboratory accreditation scheme.

Research Associations receiving support through the Department of Industry, Technology and Commerce are associations of firms engaged in applied industrial research and development, and technology transfer activities within a particular industry sector or a common technology. The level of grant to each association is determined with regard to income raised from association membership. Associations receiving support are the Bread Research Institute of Australia, Australian Welding Research Association, Sugar Research Institute, Brick Development Research Institute, Radiata Pine Research Institute, Australian Particleboard Research Institute, Australian Timber Research Institute and the Medical Engineering Research Association. Applied industrial research and development is carried out both within the associations themselves and through contractural arrangements with publicly funded research institutions including CSIRO, institutes of technology and universities.

- Industrial R&D Grants (Industrial Research and Development Incentives Act 1976)

In addition to funding Public Interest Projects (above) the Industrial R&D Incentives Act provides for grants to encourage Australian industry to increase its spending on industrial R&D as a means of developing new, and improving existing, products and processes. The IR&D Incentives Board administers three types of grants under the Scheme.

Commencement Grants are aimed at encouraging companies, whose IR&D activities have not yet developed to a stage where major projects are being undertaken, to establish or develop a basic capability in industrial research and development. The commencement grant scheme is to operate until 30 June 1986. Grants are set at 50% of the company's eligible expenditure, with an upper grant limit of $40 000 (taxable) per company. A company's eligibility for commencement grant consideration depends on whether it or any related companies have received grant payments aggregating $200 000 or more, or grant payments in respect of five or more grant years, or whether during the eight grant years prior to that covered by the First commencement grant application, the company incurred IR&D expenditure exceeding $250 000. To be eligible for a grant a company must carry on, or propose to carry on, the manufacture of goods, mining operations, or construction in Australia. Software development is eligible only when it is for computers or similar equipment manufactured by the company or a related company. The commencement grants will be available for expenditure incurred to 30 June 1986.

Project Grants are aimed at assisting organisations with established IR&D capabilities to undertake specific R&D projects. Applications for these grants are subject to competitive assessment based on specified criteria. Projects selected are usually supported on a dollar for dollar basis for up to five years. A company or a group of related companies may obtain support for more than one project at a time but overall support is normally limited to $750 000 (taxable) per year. Eligible expenditure is restricted to costs directly attributable to IR&D activity including salaries of staff, contract expenditure, etc. To be eligible for support a company must carry on, or propose to carry on, manufacturing, mining, construction or software development in Australia. Project grants may also be made to research companies which undertake a project on behalf of two or more companies, at least one of which must be unrelated to the others and at least one of which must be 'eligible'. A project conducted by 'Approved Research Organisations' on behalf of an eligible application may also qualify for grants. Applicants must demonstrate an intention to commercialise the project result. Agreements between the Incentives Board and applicants may be concluded for projects which will commence no later than 1 July 1986, and can cover expenditure up to 30 June 1989.

tomotive Industry Design Assistance Grants were commenced by the then Minister for dustry and Commerce in October 1984. The Automotive Industry Authority came into eration the same month and will be responsible for the allocation of $150 million under e Motor Vehicle and Component Development Grants Scheme. The Schemes central features e that:

- coverage will be limited to projects for the development of new or improved products;
- eligible products will be restricted to vehicles of a kind covered by the Passenger Motor Vehicle Manufacturing Plan and components for these vehicles;
- development activities eligible for support will extend beyond R&D to include design activities, including design costs for new tools, jigs and dies;
- assistance will be in the form of taxable cash grants, to be paid progressively over the life of the project as expenditure is incurred;
- the level of grant (if any) will be determined on a case by case basis but a minimum grant formula will be prescribed and grants about 50% will require Ministerial approval.

e first budget appropriation ($35 million) under the Scheme has been made for the ancial year 1985-86.

Technology and Innovation Programs

e Technology Division of the Department of Industry, Technology and Commerce undertakes ange of programs in productivity development, technology transfer, technological elopment, invention and innovation that form essential elements of the Government's ustrial development policy. The Division encourages development of:

- programs in consultation and in agreement with industry, employee organisations and government to examine specific industry sector problems, develop solutions and disseminate results;
- technology transfer programs facilitating industries' access to new technology by practical programs which assist:
  - development and extension of practical technology transfer mechanisms;
  - development and adoption of more effective information handling systems;
- co-operative technological development programs to develop, demonstrate and promote projects in industry based on industrial processes, techniques and applications to facilitate increased competitiveness of Australian industry;
- new enterprises based on Australian innovation through:
  - the Assistance to Inventors Scheme, which provides grants of up to $40 000 where appropriate to assist the commercialisation of Australian inventions from non-corporate investors;

  - an Australia-wide network of Innovation Centres to coordinate expertise and facilities required at the research, prototype, business plan, manufacturing and marketing stages of new technology-based product innovations,
  - practically oriented training for potential Australian technology entrepreneurs in the specialised commercial skills required for successful new technology based product innovation via both the Enterprise Workshop Program and the Centre for Development of Entrepreneurs at Chisholm Institute of Technology;
  - programs that raise understanding of the impact of advanced information technologies and of the commercial opportunities generated through them; an
  - programs to implement the promotion and development of high technology growth industries, assist with new product development for government procurement, analysis of market opportunities to assist new technology-based firms in the identification and assessment of market opportunities for specific new technologies, demonstration of new technology, improvement of industry awareness of new technology through workshops and seminars in specialised areas, interprogram co-ordination aimed at establishing better coordination between those Government programs set up to assist high technology growth industries and a teaching company scheme designed to improve interaction between the research and industrial sectors.

- National Materials Handling Bureau

The National Materials Handling Bureau has a charter to research, develop and promote improved materials and distribution management efficiency in Australia. This is primarily achieved through the conduct of major projects and research studies in the fields of packaging, materials handling, warehousing and distribution. specific consultancy tasks are also undertaken for industry and Government. The Bureau contributes to the development of national standards and provides representation on various Australian and international bodies associated with materials handling, packaging and distribution.

Facilities include a world standard package testing laboratory. The laboratory has a range of specialised facilities including equipment for materials and mechanical testing, shock and vibration analysis, environmental testing, and package testing and development. Project consultancies and laboratory services, including public access to some of the test equipment, are available to the private sector and Government at commercial rates.

The Bureau also provides information and advisory services which include a monthly abstract publication, telephone advice and access to computer based information systems. A comprehensive technical library, a lecture theatre and demonstration facilities are maintained. Education and promotional activities undertaken include seminars, workshops and MATPAK, an annual materials handling, packaging and distribution equipment exhibition and seminar program.

Technology Transfer Council

TTC is a non-profit company formed in 1980 by the MTIA and CAI with support from the artment to establish and conduct a technology transfer network, initially within the al manufacturing industry. Centres are located in Melbourne, Sydney, Adelaide, Perth Brisbane.

addition to Government support TTC also derives earnings from its commercial rations, and has already assisted approximately 3 000 Australian companies. It brings echnology-based, management-oriented approach to manufacturing.

TTC's primary mission is to develop new concepts and practices to assist Australian ms to become more competitive. Activities are generally carried out with groups of ms, to minimise access costs and maximise benefits through group interaction and semination of results. Increasingly TTC is focussing attention upon the need for panies to develop appropriate business plans and incorporate modern management policies ore considering introduction of technology based solutions. An example of this roach is the current group project activity based upon the Just in Time (JIT) ufacturing concept being conducted in conjunction with State Governments and Industry NSW, Vic, Qld and WA and involving a total of approximately 80 participating firms.

Biotechnology Research Grants Scheme

National Biotechnology Program Research Grants Scheme commenced in January 1984 with aim of helping to establish an Australian biotechnology industry by encouraging eraction between researchers and industry, concentrating on large scale programs and by ecting funds into commercially promising areas. Priority areas for research remain: etic engineering, cell manipulation and culture, enzyme applications and fermentation hnology. Seven of the grants awarded commencing in 1984 are continuing and are making isfactory progress. These grant programs will be completed by the end of 1987. Due to hortage of funds, only 7 new grants were commenced in 1985, 6 for 3 years and one for years. It is likely that the number of new grants commencing in 1986 will again drop to the shortage of funds and the Scheme is unlikely to reach ASTEC (A.19.2) ommended levels for some time.

Australian Productivity Council

Australian Productivity Council (APC) is a national organisation representing the ductivity improvement interests of industry, unions and government. Its programs mine the state and direction of technological advance in Australia and provide advice both industry and unions on the impact of technology in the workplace. APC also motes an understanding, within the community, of the meaning of and issues associated h productivity improvement and seeks to raise awareness of the social impact of hnological change.

1985-86 the Department provided $1.6 million to support APC in these activities and to ist it to widen the range of services offered to industry.

A.16.2 INDUSTRIES ASSISTANCE COMMISSION (IAC)

The IAC is the coordinating agency for the IMPACT Project. IMPACT is a research project to improve policy analysis of inter-related economic and social issues, particularly in the areas of trade, industry development and manpower. The Project is a cooperative effort involving a number of Commonwealth Agencies (Industries Assistance Commission, Bureau of Agricultural Economics, Bureau of Industry Economics, Bureau of Labour Market Research, Department of Arts, Heritage and Environment and Department of Immigration and Ethnic Affairs) in association with the University of Melbourne, La Trobe University and the Australian National University.

The Project involves the further development and enhancement of analytical frameworks, consisting of economic-demographic models and associated data bases and computing systems, which enable the implications of both policy induced and naturally occurring changes to be studied systematically in an economy-wide perspective.

A.17. LOCAL GOVERNMENT AND ADMINISTRATIVE SERVICES

($ million)		R&D					S&T (including R&D)	
		81-82	82-83	83-84	84-85	Projected 85-86	84-85	Projected 85-86
Commonwealth Budget sector net expenditure								
partment of Local Government and Administrative Services								
Australian Survey Office	N(a)	-	-	-	-	-	1.103	0.952
	N(b)	0.006	-	-	-	-	14.984	16.272
	N(c)	-	-	-	-	-	1.802	1.982
Grant-in-aid to Australian Insitute of Urban Studies	S(c)	-	-	-	-	-	0.035	0.035
bury-Wodonga Development Corporation	N(a)	0.002	0.006	0.002	-	-	-	-
	N(b)	0.028	0.040	0.021	-	-	-	-
Total (Budget Sector)		0.036	0.046	0.023	-	-	17.735	19.241
Commonwealth Non-Budget sector								
partment of Local Government and Administrative Services								
Australian Survey Office	N(a)	-	-	-	-	-	0.055	0.048
	N(b)	-	-	-	-	-	0.733	0.819
bury-Wodonga Development Corporation	N(a)	0.002	0.006	0.002	0.002	0.002	0.002	0.003
	N(b)	0.030	0.042	0.022	0.085	0.090	0.133	0.140
	N(c)	0.015	0.076	0.028	0.003	0.005	0.003	0.005
Total (Non-Budget Sector)		0.047	0.124	0.052	0.090	0.097	0.925	1.015
Total (Direct Commonwealth funding)		0.083	0.169	0.075	0.090	0.097	18.660	21.526
Expenditure from other sources								
bury-Wodonga Development Corporation	N(a)	0.004	0.009	0.003	-	-	-	-
	N(b)	0.056	0.063	0.033	-	-	-	-
tal (Other sources)		0.060	0.072	0.037	-	-	-	-
tal (A+B+C)		0.143	0.242	0.112	0.090	0.097	18.660	21.526

N Natural sciences and engineering
S Social Science and Humanities

(a) Intramural capital expenditure
(b) Intramural current expenditure
(c) Extramural expenditure

A.17.1 DEPARTMENT OF LOCAL GOVERNMENT AND ADMINISTRATIVE SERVICES

- Australian Survey Office

The Australian Survey Office is the Commonwealth's central surveying service authority and is responsible for land, engineering and topographic surveys for Commonwealth purposes. In particular the Office:

- arranges, subject to certain exceptions, survey work required by Commonwealth Departments or authorities and those trading authorities which elect to use it;
- provides professional surveying advice to these Commonwealth departments and authorities;
- maintains an awareness of the capacity and capabilities of the surveying industry in order to ensure that the necessary resources and expertise are and will continue to be available to service Commonwealth survey requests;
- participates and co-operates with other Commonwealth and State government surveying and mapping organisations on matters of mutual interest; confers with overseas organisations and international institutions on survey technology and on advice to developing countries; advises tertiary education institutions in Australia on survey education;
- provides a survey infrastructure in Commonwealth Territories to support mapping, land administration and land information systems.

- Australian Institute of Urban Studies

The AIUS is an independent, non-profit organisation which was established in 1967. Members of AIUS include elected representatives of all levels of Government, public servants, the private sector, Academic institutions and the urban professions. AIUS is financially supported by subscriptions from its members, donations from commerce and industry, fees for services to Government Departments and Agencies, and grants from Commonwealth and State Governments.

The objectives of AIUS include:

- the encouragement, promotion and undertaking of practically oriented research on all aspects of urban affairs, and the dissemination of authoritative information;
- to give independent and authoritative advice to all levels of Government on urban issues;
- to advise developing countries in South East Asia and the Pacific to work effectively towards solving their own problems.

The major project completed in 1984-85 was "Capital City Impact of Foreign and Local Investment". The major project for 1985-86 is "Australia's Cities and Country Towns: Urban Management, Social and Economic Development with a Focus on Local and Regional Authority Roles".

The Institute publishes a quarterly newsletter, "Australian Urban Studies".

A.17.2 ALBURY-WODONGA DEVELOPMENT CORPORATION

e development of Albury-Wodonga is a joint venture of the Commonwealth, New South Wales d Victorian Governments. In 1973 and 1974, legislation was enacted by the three rliaments to establish the Albury-Wodonga Development Corporation (Commonwealth), the bury-Wodonga (Victoria) Corporation, and the Albury-Wodonga (New South Wales) rporation.

e major activities of the corporations have been land acquisition, development of sidential, industrial and commercial land and provision of rental housing and factory commodation. The Commonwealth has also undertaken a research program into the effects the increased urbanisation of the Albury-Wodonga area on the flora, fauna and chemical ality of the water in River Murray.

A.18. PRIMARY INDUSTRY

($ million)		R&D					S&T (including R&	
					Projected		Project	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Primary Industry								
. Administrative support for S&T, not elsewhere included								
- Library Services	N(b)	-	-	-	-	-	0.376	0.4
- Ministerial Councils	N(b)-	-	-	-	-	-	0.147	0.1
- Statutory Research Funds and Special Research Grants Administration	N(b)	-	-	-	-	-	0.023	0.0
. Australian Agricultural Council Sponsored Projects	N(c)	0.058	0.076	0.069	0.205	0.220	0.205	0.2
. Australian Wine Research Institute	N(a)	-	-	-	0.003	0.004	0.064	0.0
	N(b)	-	-	-	0.253	0.249	0.425	0.4
	N(c)	0.165	0.255	0.267	-	-	-	-
. Bureau of Agricultural Economics	S(a)	-	-	-	0.155	0.012	0.822	0.0
	S(b)	1.056	1.309	1.429	1.541	1.463	8.235	8.4
. Australian Agricultural Health and Quarantine Service**	N(a)	0.029	0.004	0.008	0.006	0.012	0.117	0.2
	N(b)	0.276	0.243	0.259	0.446	0.396	8.917	7.9
	N(c)	-	0.059	0.080	2.735	2.859	19.984	21.1
. Commonwealth Special Research Grant	N(b)	-	-	-	-	-	0.002	0.0
	N(c)	0.279	0.255	0.255	0.495	0.689	0.495	0.6
. Fisheries Service	N(b)	-	-	-	-	-	1.649	1.6
	N(c)	-	-	-	-	-	1.258	1.5
. Fishery Management (Torres Strait)	N(a)	-	-	-	-	-	0.291	0.0
	N(b)	-	-	-	-	-	0.019	0.0
	N(c)	0.175	0.275	0.306	0.495	0.565	0.495	0.5
. Forestry Council	N(b)	-	-	-	-	-	0.079	0.0
	N(c)	-	-	-	0.020	0.020	0.020	0.0
. National Soil Conservation Program	sN(c)	-	-	0.341	1.050	1.053	2.261	2.6
. Plant Quarantine**	N(a)	0.035	0.030	0.248	-	-	-	-
	N(b)	0.097	0.133	0.133	-	-	-	-
	N(c)	0.017	-	-	-	-	-	-

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Commonwealth Budget sector net expenditure (continued)								
Forestry Research Grants	N(c)	0.022	0.037	0.040	0.049	0.052	0.049	0.052
Plague Locust Commission**	N(a)	0.015	0.014	0.011	-	-	-	-
	N(b)	0.051	0.059	0.046	-	-	-	-
Sub-total (departmental)		2.276	2.748	3.492	7.483	7.633	45.935	46.502
Statutory Rural Industry Research Schemes								
- Barley	N(c)	0.276	0.304	0.345	1.102	1.100	1.102	1.100
- Cotton	N(c)	-	-	0.269	0.725	0.396	0.725	0.396
- Chicken Meat	N(c)	0.180	0.194	0.205	0.282	0.370	0.282	0.370
- Dairying	N(c)	0.272	0.348	0.426	0.590	0.615	0.590	0.615
- Dried Fruit	N(c)	0.049	0.083	0.108	0.175	0.203	0.175	0.203
	S(c)	0.005	-	-	-	-	-	-
- Fishing Industry Development	N(c)	-	-	-	-	-	0.300	0.300
- Fishing Industry Research	N(c)	0.458	0.663	1.676	2.649	5.165	2.649	5.165
- Honey	N(c)	0.022	0.045	0.051	0.064	0.078	0.064	0.078
- Meat	N(c)	3.405	4.123	5.156	4.486	5.330	4.486	5.330
	S(c)	0.290	-	-	-	-	-	-
- Oilseeds	N(c)	0.298	0.307	0.282	0.377	0.377	0.377	0.377
- Pig Industry	N(c)	0.193	0.256	0.292	0.579	0.728	0.579	0.728
	S(c)	0.007	0.014	-	-	-	-	-
- Poultry	N(c)	0.066	0.131	0.132	0.220	0.170	0.220	0.170
- Tobacco	N(c)	0.197	0.420	0.381	0.496	0.525	0.496	0.525
- Wheat	N(c)	2.845	3.201	2.050	5.240	5.500	5.240	5.500
- Wine	N(c)	0.088	0.088	0.088	-	-	-	-
- Wool	N(c)	7.616	7.846	9.220	2.851	7.300	2.851	7.300
Sub-total (Commonwealth derived expenditure on rural research schemes)		16.268	18.023	20.683	19.833	27.857	20.133	28.157
Total (Budget Sector)		18.544	20.771	24.174	27.316	35.490	66.068	74.659

($ million)		R&D					S&T (including R	
					Projected		Projec	
		81-82	82-83	83-84	84-85	85-86	84-85	85-8
B. Commonwealth Non Budget Sector								
Department of Primary Industry								
. Statutory Rural Industry Research Schemes*#								
- Barley	N(c)	-	-	-	-	0.221	-	0.
- Cotton	N(c)	-	-	-	-	0.099	-	0.
- Chicken Meat	N(c)	-	-	-	-	0.133	-	0.
- Dairying	N(c)	-	-	-	-	0.151	-	0.
- Dried Fruits	N(c)	-	-	-	-	0.069	-	0.
- Fishing Industry Development	N(c)	-	-	-	-	-	0.050	0.
- Fishing Industry Research	N(c)	-	-	-	1.215	0.664	1.307	0.
- Honey	N(c)	-	-	-	-	0.016	-	0.
- Meat	N(c)	-	-	-	-	1.629	-	1.
- Oilseed	N(c)	-	-	-	-	0.127	-	0.
- Pig Industry	N(c)	-	-	-	-	0.098	-	0.
- Poultry	N(c)	-	-	-	-	0.088	-	0.
- Tobacco	N(c)	-	-	-	-	0.150	-	0.
- Wheat	N(c)	-	-	-	-	1.100	-	1.
- Wine	N(c)	-	-	-	0.079	0.067	0.079	0.
- Wool	N(c)	-	-	-	-	5.587	-	5.
Total (Non-Budget Sector)		-	-	-	1.294	10.200	1.435	10.
Total (Direct Commonwealth Funding)		18.544	20.771	24.174	28.610	45.689	67.503	85.
C. Expenditure from other sources								
Department of Primary Industry								
. Statutory Research Funds and Special Research Grants Administration	N(b)	-	-	-	-	-	0.553	0.
. Wine Research Institute	N(d)	-	-	-	0.022	0.037	0.061	0.
	N(b)	-	-	-	0.167	0.216	0.381	0.

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Bureau of Agricultural Economics ##	$S(^{a}_{b})$	(0.096)	(0.141)	(0.211)	(0.173)	(0.192)	(0.923)	(1.105)
Australian Agricultural Health and Quarantine Service**	N(c)	0.017	0.029	0.030	-	0.105	26.099	26.335
Plague Locust Commission** (State-contributed funds)	N(a)	0.015	0.014	0.011	-	-	-	-
	N(b)	0.051	0.059	0.046	-	-	-	-
Sub-total		0.083	0.102	0.087	-	0.105	26.099	26.335
Statutory Rural Industry Research Schemes#								
- Barley	N(c)	0.222	0.336	0.427	0.726	1.586	0.846	1.771
- Cotton	N(c)	-	-	0.407	0.318	0.916	0.373	1.000
- Chicken Meat	N(c)	0.193	0.203	0.197	0.187	0.167	0.246	0.250
- Dairying	N(c)	0.309	0.469	0.443	0.598	0.453	0.752	0.615
- Dried Fruit	N(c)	0.049	0.087	0.102	0.213	0.096	0.268	0.153
	S(c)	0.005	-	-	-	-	-	-
- Honey	N(c)	0.032	0.044	0.063	0.038	0.036	0.054	0.056
- Meat	N(c)	3.740	5.128	5.261	6.704	4.763	7.056	5.124
	S(c)	0.318	-	-	-	-	-	-
- Oilseeds	N(c)	0.275	0.295	0.295	0.248	0.364	0.280	0.408
- Pig Industry	N(c)	0.225	0.264	0.310	0.416	0.477	0.569	0.680
	S(c)	0.007	0.015	-	-	-	-	-
- Poultry	N(c)	0.088	0.163	0.187	0.061	0.199	0.085	0.240
- Tobacco	N(c)	0.596	0.461	0.552	0.938	0.710	0.938	0.710
- Wheat	N(c)	2.443	2.923	4.555	5.706	5.019	6.062	5.402
- Wine	N(c)	-	-	-	0.015	0.022	0.015	0.022
- Wool	N(c)	6.664	8.653	9.220	17.456	10.486	18.557	11.770
Sub-total (Industry-derived expenditure on rural research schemes)		15.169	19.042	22.020	33.625	25.294	36.099	28.203
Total (Other sources) ##		15.252	19.142	22.107	33.813	25.652	63.192	55.666
Total (A+B+C) ##		33.796	39.914	46.281	62.423	71.342	130.695	140.811

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
$\binom{a}{b}$	Intramural expenditure (capital and current)	(c)	Extramural expenditure

# Amounts indicate payments for research made from the Trust Funds concerned, attributable to commonrated appropriation (Table A-B) or industry contribution (Table C). The convention adopted for the reporting of expenditure to and from Research Trust Funds is outlined in D.7. See the table in the body of the text for industry contributions to the Trust Funds.

** The Bureau of Animal Health, Plant Quarantine and the Plague Locust Commission have been combined into the Australian Agricultural Health and Quarantine Service.

## The intramural expenditure of the Bureau of Agricultural Economics shown in C is funded by grants from the Meat and Wool Industry Research Schemes. Therefore they have been excluded from totals in order to avoid double-counting for the Ministry as a whole.

A.18.1 DEPARTMENT OF PRIMARY INDUSTRY

A major role of the Department is to provide advice to the Minister for Primary Industry on rural industry policy issues and to implement and administer legislation and government programs for rural industries and their produce. These policy issues by necessity frequently involve a recognition and consideration of scientific and technical factors. The administration of research funds is a function of the Department.

The Bureau of Agricultural Economics (BAE) operates to a certain extent outside the mainstream of the Department's activities, but is responsible to the Secretary.

- Bureau of Agricultural Economics (BAE)

The Bureau's responsibilities include economic research and analysis for the agricultural, pastoral, horticultural, dairying, intensive livestock, forest and fishing industries. The BAE provides government with reports and economic studies necessary for policy formulation and review. To aid decision making by farmers, farmer organisations, industry bodies and others associated with agriculture, the Bureau disseminates analyses and reports of the agricultural situation and prospects.

Subject to its existing commitments and demands for specific investigations, the Bureau is free, indeed expected, to direct its work into economic research and investigation it considers most useful.

The BAE's program has four major components:

- monitoring and forecasting the economic situation on Australian farms and evaluating the farm-level consequences of current and prospective changes in economic conditions and policies;
- evaluating present and future market prices and prospects for rural commodities in domestic and world markets;

- conducting in-depth studies into the economics of agricultural production, marketing, prices and agricultural trade opportunities; and

- servicing departmental, ministerial, administrative and policy needs.

r BAE activities in 1984-85 included:

- EEC agricultural policies;
- international determinants of Australian exchange rates;
- the use of underwriting in Australian agriculture;
- crop insurance and drought policies;
- farm level analysis of government market milk policies in the Australian dairy industry;
- South East Asia as a market for Australian beef;
- evaluation of the US wool promotion campaign;
- economic evaluation of the storage, transport and handling of Australian grain harvest;
- a model of the Mackay sugar industry: the economic effect of regulation;
- changes in the farm labour force;
- Japanese and Korean demand for pulp and pulpwood;
- Japanese market for prawns;
- the effect on farm income of alternative forms of taxation.

ific areas to be studied in 1985-86 include:

- agricultural policies in the European Community: implications for world trade and Australian agriculture;
- a model of aggregate wage determination in Australia;
- determinants of the real effective exchange rate;
- taxation treatment of the livestock inventory valuation;
- brucellosis and tuberculosis eradication campaign options in northern Australia;
- submission to the Industries Assistant Commission inquiry into multirisk insurance schemes;
- analysis of the benefits and costs of rural research;
- farm-level effects of taxation alternatives;
- water pricing policies in Australia;
- economics of preserving land for agricultural use in Australia;
- climate/weather information requirements of the rural sector;
- a review of farm performance measures;
- farm-level effects of minimum pricing arrangements for wine grapes;
- storage and packing in the apple and pear industry;
- the demand for Australian sawntimber
- short-term forecasting of world pulp prices;
- medium-term forecasting of world dairy product prices;
- marketing margins and factory cost studies of the dairy processing industry;
- evaluation of management schemes in fisheries;
- development of bio-economic models to simulate policies in different fisheries;
- analysis of beef import policy decisions in Japan and Korea;
- processing costs in the meat industry;
- appraisal of net benefits from computer-aided livestock marketing;
- evaluation of the US wool promotion campaign;
- issues in wool price stabilisation;
- impact of protection on wool demand;
- seasonality in wool stocks and price levels;
- centralised shipping arrangements for export meat;

- use of the Mackay sugar model to examine issues of longer term structural change in the sugar industry;
- analysis of the effects on the world sugar market of changes in US and EEC sugar policies;
- analysis of the potential of the oilseeds industry in Australia;
- demand and supply of selected fruits;
- sales tax on wine;
- developments in the markets for fruit and vegetables;
- an economic evaluation of the nursery industry;
- impact of the US farm bill on the Australian grains sector;
- economic evaluation of the storage, transport and handling of Australia's grain;
- Australian grain marketing costs as they affect Australia's ability to compete in the world market;
- a survey analysis of the on-farm grain storage situation in Australia.

. Australian Agricultural Health and Quarantine Service (AAHQS)

The AAHQS is responsible for:

- provision of accurate technical advice on Agricultural Health and Veterinary Science;
- prevention of dangerous and ineffective drugs and chemicals in agriculture;
- control and eradication of endemic and exotic animal and plant diseases; and
- ensuring the health of imported and exported animal and plant species.

During the financial year 1984-85, the AAHQS has taken responsibility for the operation of the Plant Quarantine Service and the Australian Plague Locust Commission.

The Plant Quarantine Research Program investigates problems of an operational nature peculiar to Plant Quarantine, including the development and evaluation of techniques to eliminate pests and diseases in imported plants and plant products.

Types of research undertaken at the Plant Quarantine Research Station include the investigation of the penetration of fumigation gases into timber, logs and packing material, investigation of new techniques for the elimination of virus diseases from plant material, and work on aircraft disinfestation.

The Australian Plague Locust Commission is financed by the States of New South Wales, Victoria, South Australia and Queensland with a matching contribution from the Commonwealth. The Commission engages in operations to combat outbreaks or potential outbreaks of the Australian plague locust and performs research related to this role.

Operations include the collection and collation of data on locust populations, the forecasting of significant changes and developments in locust populations, control operations, the development of improved control measures, the monitoring of all actions and the effects of control operations and the provision of advice to individual States on locust problems.

. Australian Fisheries Service

The Service manages Australian fisheries in cooperation with the States, including:

- interpretation of biological data on available species, sustainable catch rates and environmental aspects;

- application of the most efficient and effective fishing gear and technology;

- interpretation of economic research and analysis, involving costs and earnings (profitability) surveys and ad hoc investigations;

- interpretation of available economic data and the evaluation of the likely impact of fisheries management proposals; and

- procurement of accurate and timely catch, marketing and production statistics and information.

ner activities include the development of legislation affecting the management of sheries; participation in the education/training of Commonwealth and State fisheries' ficers involved in activity under Commonwealth delegation (including the training of ofessional fishermen, for example in the use of sonar equipment); encouraging the velopment of the Australian fishing industry by the provision of grants from the Fishing dustry Research Trust Account and the Fisheries Development Trust Account; provision of cretariat facilities to sub-committees of the Standing Committee on Fisheries; rticipation in negotiations within international organisations or with foreign vernments on fisheries matters and in the formulation of agreements with foreign vernments or corporations; dissemination of information and advice to the industry by e production of monthly *Australian Fisheries* and other publications; and where possible d consistent with Australia's international aid program, the provision of assistance to veloping countries in relation to fisheries matters.

Management of Torres Strait Fisheries

e Torres Strait Treaty between Australia and Papua New Guinea, which was ratified in bruary 1985, provides for either Country to propose joint management of a particular shery in the Torres Strait Protected Zone.

e Torres Strait Treaty Fisheries Act 1984 provides the necessary powers in Commonwealth w for managing the fisheries in that area. The Treaty obliges Australia and PNG to otect the traditional way of life and livelihood of traditional inhabitants; co-operate d consult in conservation and management of Protected Zone fisheries,promote economic velopment and employment for traditional inhabitants, and protect and preserve the rine environment and indigenous flora and fauna. CSIRO undertakes a research program to pport the implementation of the fisheries provisions of the Treaty. Projects currently progress include tropical rock lobster traditional fishing, effect of trawling, and ckerel fishing. In addition, the Department maintains field staff in Cairns and on ursday Island to undertake monitoring of fishing activity in the area and to collect and lyse data relating to catch record and effort.

National Soil Conservation Program

inst the background of an urgent need on one hand to combat land degradation nationally d limited Commonwealth responsibility on the other, in 1983 the Government initiated the tional Soil Conservation Program.

e Program aims to develop and implement national policies for the rehabilitation and stainable utilisation of the nation's soil and land resources. Its broad goals are:

- that all lands in Australia be used within their capability;
- that land use decisions be based on whole catchment/regional land management planning concepts;
- that all land users and levels of government meet their respective responsibilities in achieving soil conservation;
- that effective co-operation and co-ordination occur between all sectors of the community, disciplines and agencies involved in the use and management of land and water resources; and
- that the whole community adopt a land conservation ethic.

The Program is directed at all sectors of the community with an interest or involvement in land management. Landholders, with whom the main responsibility for erosion control rests, are the major target by community groups; researchers, local government and various agencies in the State and Federal governments also have important roles to play. The emphasis is on co-operation and co-ordination as the fragmentation of responsibility amongst many government agencies has, in the past, contributed to the present extent of the damage.

Financial assistance, although just one facet of the overall program is an essential ingredient for the support of a range of other policy measures to be employed such as education, training, demonstration, research, publicity, provision of technical assistance and construction of works. Funds have been provided for projects in these broad areas of activity.

Structurally, the Program presently has two components. The first provides funds to State soil conservation agencies to enhance their training, demonstration, research, public awareness, advisory, data collection, design and construction activities. The second component provides funds to other organisations who can contribute to the attainment of the aim of the Program through training, education, innovation, research, program development and liaison or co-ordination activities. Projects of national importance involving State co-operation or national co-ordination are accorded priority.

. Australian Agricultural Council-Sponsored Projects

The Department of Primary Industry provides funds for the Commonwealth contribution to Commonwealth/State projects recommended by the Australian Agricultural Council. Current projects include fresh fruit disinfestation, support for the Fruit Variety Foundation, and the Commonwealth Advisory Laboratory on detergents and sanitisers. In addition, each year Australia makes a $20 000 contribution to the Commonwealth Forestry Institute (CFI). The CFI is closely associated with the Department of Agriculture and Forest Science, University of Oxford, UK, and conducts forestry research and training primarily for the benefit of developing countries.

. Rural Industry Research Trust Funds

The Rural Industry Research Trust Funds differ somewhat in regard to their purposes. The general objective of the Funds, however, is to provide money for research and dissemination of information, relating to production improvement, in a broad sense, within the industry. Commonwealth support is in most cases on a 1:1 matching of expenditure to money raised from producers in the form of a levy on their produce.

TABLE 17. INDUSTRY CONTRIBUTIONS TO PRIMARY INDUSTRY TRUST ACCOUNTS
(estimated proportion of levies attributable to R&D and S&T purposes)

million)	78-79	79-80	80-81	81-82	82-83	83-84	84-85	Projected 85-86
ley	-	-	0.311	0.472	0.290	1.028	0.993	1.771
cken Meat	0.189	0.226	0.235	0.216	0.241	0.234	0.240	0.250
ton	-	-	-	-	0.196	0.254	0.670	1.000
rying	0.435	0.459	0.422	0.421	0.535	0.565	0.600	0.615
ed Fruit	0.089	0.090	0.119	0.119	0.120	0.093	0.116	0.151
ey	-	-	0.018	0.056	0.045	0.050	0.050	0.056
t	3.198	3.178	3.297	3.021	4.164	3.608	4.605	5.124
seeds	0.349	0.412	0.275	0.299	0.229	0.295	0.310	0.408
Industry	0.290	0.288	0.389	0.415	0.401	0.415	0.596	0.680
ltry	0.138	0.096	0.142	0.146	0.150	0.150	0.162	0.240
acco	0.393	0.389	0.378	0.412	0.473	0.546	0.673	0.710
at	3.466	3.086	2.012	3.108	1.967	4.650	4.650	5.402
e	-	-	-	-	-	-	0.458	0.519
l	1.932	10.239	7.538	8.766	8.832	10.000	10.700	12.300
als	10.479	18.463	15.136	17.392	17.643	21.888	24.823	29.226

Funds promote a degree of self-help through industry involvement in selecting and ancing industry specific rural research. Their impact on research priorities is ught to be greater than the level of funding would suggest due to their 'pump-priming' 'catalytic' effect.

e of the R&D supported by the funds includes the following:

- For WOOL five fields of research are supported - production, wool harvesting, measurement, economic and textile research. Production research covers soil deficiences through to research in the chemical structure of the messenger protein controlling wool production. Current programs aim to produce new plants with high resistance to insects, pests and plant diseases, particularly clover starch and root rots. The wool harvesting program is concerned with the development of improved shearing methods for use in traditional and automated shearing. A major project involves the biological defleecing program with very promising work on Epidermal Growth Factor.

- WHEAT research programs cover a very wide range of projects including diseases of wheat and pest control, studies of the nitrogen cycle and fertilisation, genetic research, and harvesting methods.

- Payments from the FISHERIES Development Trust Account are made within the terms of the Fishing Industry Act 1956 and are intended to finance activities designated to foster the development of the Australian fishing industry. Major projects supported during 1984-85 include:

- monitoring of south-east trawl fishery,
- Orange Roughy survey,
- tuna handling training course,
- pair trawling in Southern Queensland,
- minor development projects.

. Australian Wine Research Institute

The functions of the Australian Wine Research Institute are:

- to carry out applied research in the field of Oenology,
- to service the extension needs of the winemakers of Australia,
- to be involved in the teaching of Oenology at both the undergraduate and post-graduate levels,
- to assume responsibility for the coordination of Oenological activities and the collection, collation and dissemination of information on Oenological-Viticultural research to the benefit of the Australian Wine Industry.

. Commonwealth Special Research Grant

The purpose of the Grant is to provide Commonwealth Government contributions to rural research outside the scope of the industry specific Commonwealth rural research funding arrangements. Grant funds were usually matched on a dollar for dollar basis by the industry which benefits from the research. Other areas which are eligible for grant support include research not specifically related to a single industry (multi-industry research) and development of new or infant industries.

Some projects funded in 1985-86 include research into productivity and disease control in fruit, vegetables, goat fibre, does, cereals, legumes, forestry and sugar.

. Commonwealth Forestry Post-Graduate Research Awards

Each year the Department of Primary Industry makes available awards for the degree of Master and/or Doctor of Philosophy at an Australian university. Fields of study are nominated by the Standing Committee of Australian Forestry Council and cover topics of current interest, calling for urgent investigation, mainly for projects not being undertaken by the various State forest services.

A.19. PRIME MINISTER AND CABINET

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
ommonwealth Budget Sector net Expenditure								
rtment of Prime Minister and Cabinet								
ffice of Youth Affairs	S(b)	-	-	0.012	0.01&	0.01&	0.01&	0.01&
	S(c)	0.028	0.012	0.064	0.030	0.070	0.030	0.070
ralian Audit Office	S(a)	-	-	-	-	-	0.025	-
	S(b)	-	-	-	-	-	0.328	0.577
	S(c)	-	-	-	-	-	0.013	-
ralian Science and chnology Council STEC)								
	sN(b)	-	-	-	-	-	1.328	1.503
	sN(c)	-	-	-	-	-	0.020	0.010
ce of Public Service Board lanning and Statistical Services Section	S(b)	-	-	-	-	-	0.435	0.458
ostgraduate Awards	nS(c)	0.046	0.063	0.069	0.151	0.189	0.151	0.189
otal (Direct Commonwealth funding)		0.074	0.075	0.145	0.191	0.269	2.340	2.817

N	Natural sciences and engineering	S	Social sciences and humanities
N	Includes small component of social sciences and humanities		
S	Includes significant proportion of natural sciences and engineering.		
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure	&	DoS estimates

A.19.1 AUSTRALIAN AUDIT OFFICE

t science and technology activities are conducted by full-time staff of the Office and directed to:

- developing and implementing new audit methodologies and techniques including those related to ADP applications and efficiency/cost effectiveness audits;
- reviewing developments in accounting and audit technology from all sources and where appropriate presenting these developments to other areas of the Office; and

- assisting national audit institutions in Asian and Pacific countries to develop and implement new audit methodologies and techniques appropriate to their needs.

The Audit Office has found it desirable to acquire some outside assistance with the application of microcomputers to the audit task.

A.19.2 AUSTRALIAN SCIENCE AND TECHNOLOGY COUNCIL (ASTEC)

Science and technology play an increasingly important part in Australia's development, and are basic to Australia's capacity to meet challenges in areas such as industrial productivity and competitiveness, energy and resource availability, and management of the environment.

The Government has recognised that high-level, high-quality independent science and technology advisory machinery is necessary if good decisions are to be made in formulating objectives, establishing the most effective and appropriate institutional means for achieving them, and assigning priorities on a rational and considered basis. The Government established the Australian Science and Technology Council (ASTEC) in 1977 with these considerations in mind. ASTEC became a statutory body in 1979.

The Council is the Government's principal independent source of advice on issues relating to science and technology, including:

- the advancement of scientific knowledge and the development and application of science and technology in relation to the national well being;
- the adequacy, effectiveness and overall balance of the national effort in science and technology in government, industry, education and other sectors of the community;
- the assessment of gaps and overlaps in science and technology in Australia;
- the identification and support of new ideas in science and technology likely to be of national importance;
- the practical development and application of research discoveries and the fostering of technological innovation in industry; and
- the means of improving efficiency in the use of resources related to science and technology.

The Council is placing increased emphasis on its tactical and strategic roles in assisting the Government to encourage Australian science and technology to meet the nation's needs and objectives. This role is discharged in the following ways:

- provision of briefing to the Government, through the Prime Minister, on any proposal with a significant science and technology content which comes before Cabinet;
- advice to Budget Cabinet on the relative priorities of those proposals brought forward by Ministers which involve science and technology;
- advice to the Government on current issues involving science and technology arising from any portfolio; and
- formal reports on subjects referred to the Council or initiated by ASTEC itself.

The Council has no executive responsibilities, but is able to advise on operational arrangements, and draws on existing departments and agencies for the expertise, knowledge and assistance necessary to enable its functions to be discharged effectively.

A.19.3 OFFICE OF THE PUBLIC SERVICE BOARD

Planning and Statistical Services Section

an resource planning is no longer a major part of the duties carried out by this tion, and the emphasis has shifted to development and undertaking of surveys and census APS staff where information is not available through other means. Recent projects lude a census of APS staff suffering from RSI, and an attempt at quantifying the career efits of various APS executive training courses. Results of surveys and other studies normally set out in the PSB Annual Report, and ongoing statistical collections tribute to the Board's Statistical Yearbook.

ubstantial proportion of S&T effort continues to go towards maintaining computerised ords of all APS staff.

Postgraduate Awards

h year the Board makes awards for postgraduate study, usually involving research ards a PhD or Masters degree. There are two schemes: one for study in any appropriate ld; and one specifically for management studies.

A.19.4 YOUTH STUDIES

Office of Youth Affairs was set up by the Commonwealth Government in 1977 with the aim improving coordination and consultation between Commonwealth Government departments, te and Local government and non-government organisations in relation to Commonwealth grams and policies which affect young people.

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Resources and Energy								
. Energy Research and Development Division	N(a)	-	-	-	-	-	0.054	0.025
	N(b)	-	-	-	-	-	1.422	1.471
	N(c)	0.008	-	-	-	-	-	-
. National Energy Research Development and Demonstration (NERD&D) Program: Energy Trust Account	N(c)	8.917	-	12.182	12.035	11.620	14.933	13.971
	S(c)	0.351	-	0.452	0.251	-	0.274	-
. National Water Programs	$_{s}$N(b)	0.029	0.076	0.105	0.034	-	0.040	-
	$_{s}$N(c)	1.383	1.343	0.634	0.214	0.541	8.568	8.968
. Bureau of Mineral Resources, Geology and Geophysics	N(a)	0.573	2.006	1.060	4.711	4.785	4.952	5.150
	N(b)	13.056	14.556	15.231	19.270	22.418	25.345	28.946
	N(c)	0.010	0.010	-	-	-	-	-
. Australian Safeguards Office	N(a)	0.004	-	-	-	0.003	-	0.003
	N(b)	0.005	0.025	0.026	0.044	0.041	0.044	0.041
	N(c)	-	0.003	0.012	-	-	-	-
. Division of National Mapping	^{s}N(a)	-	-	-	-	-	0.537	2.806
	^{s}N(b)	-	-	-	-	-	11.868	12.389
	^{s}N(c)	-	-	-	-	-	0.419	0.907
. LANDSAT Station	N(a)	-	-	-	-	-	0.025	0.115
	N(b)	-	-	-	-	-	0.027	0.127
	N(c)	-	-	-	-	-	1.579	1.604
Australian Atomic Energy Commission	N(a)	1.632	2.325	1.718	2.917	3.902	3.958	4.545
	N(b)	24.021	27.211	22.394	24.837	26.415	37.747	39.646
	N(c)	0.808	0.651	0.564	0.665	0.675	0.665	0.675
Total (Budget sector)		50.795	48.205	54.378	64.978	70.400	112.457	121.399

Commonwealth Non-Budget sector								
artment of Resources and Energy IERD&D Program:								
· Energy Research Trust Account	N(c)	-	10.875	11.045	-	-	-	0.400
	S(c)	-	0.818	0.039	-	-	-	-
· Coal Research Trust Account	N(c)	-	-	-	-	-	-	1.200
ivision of National Mapping	N(c)	-	-	-	-	-	0.931	0.969
andsat Station	N(a)	-	-	-	-	-	0.078	0.061
	N(b)	-	-	-	-	-	0.086	0.115
	N(c)	-	-	-	-	-	0.429	0.760
ustralian Atomic Energy Commission	N(a)	-	-	-	-	-	0.191	0.109
	N(b)	-	-	-	-	-	2.372	2.569
otal (Non-Budget sector)		-	11.692	11.084	-	-	4.087	6.183
otal (Direct Commonwealth funding)		50.795	59.898	55.462	64.978	70.400	116.544	127.582
xpenditure from other sources								
rtment of Resources and Energy ustralian Safeguards Office	N(b)	-	-	-	-	-	-	0.100
	N(c)	-	-	-	-	-	0.155	0.030
ERD&D Energy Projects	N(c)	0.026	-	-	-	-	-	-
oal Research Trust Account	N(c)	4.766	3.958	1.893	2.794	3.369	4.147	3.800
ureau of Mineral Resources, Geology and Geophysics	N(a)	0.006	0.027	0.005	0.033	0.062	0.033	0.062
	N(b)	0.214	0.207	0.075	0.130	0.300	0.130	0.300
ralian Atomic Energy mmission	N(a)	0.060	0.083	0.032	0.056	0.047	0.257	0.167
	N(b)	0.821	0.935	0.391	0.474	0.333	2.968	3.162
otal (Other sources)		5.893	5.210	2.396	3.738	4.552	8.418	8.864
otal (A+B+C)		56.688	65.107	57.858	68.716	74.952	124.962	136.445
ess intra- Ministry transfers#		(0.897)	(0.647)	(0.423)	(0.354)	(0.243)	(0.354)	(0.243)
otal		55.971	64.460	57.435	68.362	74.709	124.608	136.202

N Natural sciences and engineering S Social sciences and humanities

^{S}N Includes small component of social sciences and humanities

(a) Intramural capital expenditure (b) Intramural current expenditure

(c) Extramural expenditure

# Some intramural expenditure of the BMR and the AAEC is funded by grants under t National Energy Research Development and Demonstration Program. the Total is adjusted to avoid double counting for the Ministry as a whole.

A.20.1 DEPARTMENT OF RESOURCES AND ENERGY

. National Energy Research, Development and Demonstration (NERD&D) Program

The National Energy Research, Development and Demonstration Council (NERDDC) was established in 1978 to advise the Minister for Resources and Energy on the development a coordination of a national energy R,D&D program and to recommend support for individual research, development and demonstration projects.

In developing its recommendations for support grants, NERDDC takes into account the existing level of research activity in Australia and identifies those areas where additional support is required to bring Australia's overall energy R,D&D effort into lin with established priorities.

Applications for support grants are invited annually by NERDDC. The Council recommends the commissioning of projects where applications are not received in priority technology areas. Since 1978, grants totalling around $145m have been approved on the advice of th Council.

The Energy Research and Development Division of the Department of Resources and Energy administers the Program and also provides advice to the Minister on energy R&D policy. The Division also provides secretariat and technical support for NERDDC and its seven technical standing committees.

. National Water Programs

The Water and Development Division of the Department of Resources and Energy administers research grants and activities to support programs and policies concerned with the planning, development and management of Australia's water resources.

Current activities include:

- Federal Water Resources Assistance Program (FWRAP)
- National Water Resources Assessment Program (NWRAP)
- Federal Water Research Program

Under the predecessor National Water Resources Program financial assistance was provided to the States each year over a six year period ending 30 June 1984 to undertake works of high priority. FWRAP was instituted from 1984-85.

rt from major construction works, a number of studies have been undertaken as part of program. These include studies into River Murray salinity and drainage control, land salinity control in Western Australia and floodplain management.

National Water Resources Assessment Program was initiated in 1964 as a priority of the tralian Water Resources Council. Under the Program, Commonwealth assistance has been vided to the States to accelerate the collection of basic water resources data covering face water, groundwater and water quality. A considerable body of data on Australia's er resources has been amassed over a period of almost 20 years.

Perspective on Water Resources to the Year 2000 Study was completed early in 1983, , later in that year, the report, WATER 2000, was published. Consideration of the ommendations of this report led to the development of FWRAP and substantial changes to AP.

AWRC Water Research Program was commenced in 1968 with the aim of filling gaps in rent research efforts in areas of direct relevance to the activities of Australian er authorities. Research results are disseminated by reports, workshops and other ivities. Information on the results is also available through our on-line national er data base, STREAMLINE. Recently a study to investigate the need for, and the sible role of an Institute of Freshwater Studies was completed and it resulted in the ablishment of a new independent Australian Water Research Advisory Council (AWRAC), to ise on a national program of water research. $250 000 has been made available to begin s program in 1985-86.

Bureau of Mineral Resources, Geology and Geophysics (BMR)

was established in 1946 and is a geoscientific research organisation within the artment of Resources and Energy. Since June 1979 the BMR has had an enhanced role in ation to the exploration for and assessment of Australian energy resources. This anced role, as announced by the then Prime Minister in October 1979, is:

(i) to develop an integrated, comprehensive, scientific understanding of the geology of the Australian continent, the Australian offshore area and the Australian Antarctic Territory, as a basis for mineral exploration; this is to be done where appropriate in cooperation with State Geological Surveys and other relevant organisations and having regard to priorities for the search for minerals approved by the Minister for Resources and Energy;

(ii) to be the primary national source of geoscience data and to publish and provide information; and

(iii) to undertake mineral resource assessments in accordance with programs and priorities approved by the Minister for Resources and Energy with the advice of BMR.

consists of four research Divisions, a Resource Assessment Division, a Geobiological oratory (jointly staffed with CSIRO) and two Branches. The broad functions of these isions and Branches are as follows:

- Division of Geophysics

Study the structure and characteristics of the crust and upper mantle (including observatory functions); undertake airborne radiometric and magnetic surveys as a basis for mineral exploration; carry out research into geophysical exploration techniques and applications.

- Division of Petrology and Geochemistry

Undertake geochemical, petrological and mineralogical studies of major sedimentary and igneous rock suites, of the environments of metalliferous deposits, and of the deposits themselves; undertake structural analyses.

- Division of Continental Geology

Study sedimentary basins and systems which may host fossil fuels or mineral deposits; study the characteristics and origin of fossil fuels; study the effects of surface processes on the bedrock of Australia; carry out hydrogeological studies of basins.

- Division of Marine Geosciences and Petroleum Geology

Undertake regional offshore geological and geophysical investigation; analyse and integrate offshore petroleum exploration company data.

- Baas Becking Geobiological Laboratory

Study low temperature processes associated with base metal mineralisation and hydrocarbo in sedimentary basins.

- Resource Assessment Division

Review and assess the petroleum and mineral resources of Australia and its Territories; study the Australian petroleum and mineral industries in a world context and assess the likely availability of Australia's resources through time; undertake research related t resource assessment and provide scientific and technical advice related to the formulati and administration of Commonwealth Government policies concerning the occurrence and extraction of Australia's petroleum and mineral resources; establish and maintain a national geoscience database.

- Special Projects and Geoscience Services Branch

Undertake national and international geoscientific map projects; undertake foreign aid projects, and long-term projects, for example in Antarctica. Produce maps and publications; maintain the Library and Museum.

- Planning and Programs Branch

Undertake administrative services; provide information; provide advice on policy and programs.

BMR's research activities are grouped into eight major scientific programs:

- Fossil Fuels: investigates sedimentary basins, their structure and history in orde to develop an understanding of the processes controlling the genesis and distribution of fossil fuels and to provide a basis for their exploration and assessment.

Minerals: to develop the understanding of the origin, abundance, age, and stribution of Australia's mineral resources in the context of the structure and ological history of the continent, and its various geological provinces as a basis for ploration and assessment.

Groundwater: to establish the hydrodynamics and hydrochemistry of Australia's major oundwater resources as a basis for their assessment and development.

Seismic Monitoring: to monitor earthquakes and explosions as a basis for assessing e earthquake risk of the Australian continent, contributing to national and ternational seismology, studying the tectonic movements of the Australian plate, and nitoring underground nuclear explosions.

National and International Geoscience Maps: to produce maps of the Australian ntinent, Territories, and adjacent areas which depict the distribution and geological tting of petroleum and mineral resources and show the understanding of fundamental ology and geophysics.

Overseas Programs: to participate in international collaborative programs relevant BMR program objectives, assist in the coordination of wide Australian participation, ve effect to Government aid programs in the geological sciences, and participate in tarctic research.

Petroleum and Mineral Resource Assessment: to assess Australia's petroleum and neral resources, determine the likely availability of these resources, and provide ientific and technical advice in relation to petroleum and mineral exploration and velopment.

National Geoscience Database: to establish and maintain a national geoscience tabase so that scientific and technical data are readily available in a useful format to ose engaged in petroleum and mineral exploration, geoscience research, and resource sessment.

30 June 1985 BMR had a full-time staff of 576, with over 200 research and other ientists, 200 technical and cartographic staff, and 100 clerical and other support aff. BMR is funded primarily by direct appropriations from the Commonwealth Parliament.

Division of National Mapping

e prime tasks of the Division of National Mapping (Natmap) are to provide coverage of stralia with topographic maps, to make bathymetric maps of Australia's continental shelf d to make thematic and special purpose maps. The topographical mapping of Australia is cooperative enterprise shared between the Commonwealth and the States. The Department Defence contributes to this activity.

her Activities of Natmap are:

- Co-ordination of Commonwealth activities for Mapping, Charting and Surveying;
- Maintenance of the National Geodetic Network;
- Operation of the Australian Landsat Station, to provide Australia with the capability for the reception, processing and analysis of data from Landsat Earth Resources Technology Satellites.

. Australian Safeguards Office

The Australian Safeguards Office operates the national system of accounting for and control of nuclear material as required by the agreement between Australia and the International Atomic Energy Agency (IAEA) for the application of safeguards in connection with the treaty on the non-proliferation of nuclear weapons. It also implements safeguards requirements of Australia's bilateral safeguards agreements and ensures that agreed physical protection measures are applied.

The practical implementation of safeguards in Australia is supported by a program of research and development which included, in 1984-85:

- The application of portable personal computers to Safeguards. This includes the development and evaluation of procedures, BASIC programs for data storage and processing, communications with portable microprocessor controlled instruments and with other computers.

- Study of the application of Reactor power monitors to safeguards. This is a theoretical study only, without the opportunity for evaluation.

- Demonstration of safeguards techniques for small uranium enrichment plants.

- Provision of a cost free expert to the IAEA.

- Evaluation of advanced statistical techniques in nuclear materials accountancy.

A.20.2. AUSTRALIAN ATOMIC ENERGY COMMISSION

The Australian Atomic Energy Commission is the principal agency for nuclear R&D in Australia. The Commission also provides technical advice to government on a range of nuclear related matters. Its main research programs cover:

- nuclear waste management, including development of the Synroc process for the immobilisation of high level radioactive wastes;

- providing to departments of nuclear medicine in Australian hospitals locally-produced radiopharmaceuticals and radioisotopes for diagnosis and therapy;

- the use of radioisotopes and radiation for industrial processing, tracing applications, food irradiation and sterilisation;

- environmental science with special reference to the Australian uranium mining industry; and

- supporting research in fields of fusion technology, safeguards, fission and health and safety assessments of nuclear plant and operations.

The Commission operates two research reactors: the 10MW High Flux Australian Reactor (HIFAR) and the 100KW Moata reactor. These reactors are used for the commercial production of radioisotopes for use in medicine, industry and research, as well as providing research facilities for the AAEC, universities and other tertiary bodies.

Technical liaison is maintained with a wide range of bodies involved in atomic energy including the International Atomic Energy Agency, the OECD Nuclear Energy Agency, national and international governmental authorities, Australian State government bodies and universities.

A.21. SCIENCE

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
Commonwealth Budget sector net expenditure								
artment of Science								
Administrative and other costs not elsewhere included	N(a)	-	-	-	-	-	0.152	0.202
	N(b)	-	-	-	-	-	8.105	9.258
Antarctic Activities								
- Antarctic Division	N(a)	3.285	6.981	6.501	6.145	6.665	10.801	11.470
	N(b)	8.796	10.470	12.110	15.140	16.281	26.294	28.096
	N(c)	0.034	0.017	0.008	0.032	0.039	0.032	0.039
- Scott Polar Research Institute Grant	N(c)	-	-	-	-	-	0.010	0.010
Australian Government Analytical Laboratories	N(a)	0.019	0.025	0.052	0.028	0.028	0.588	1.144
	N(b)	0.343	0.528	0.630	0.500	0.530	7.366	6.652
Bureau of Meteorology	N(a)	0.003	0.031	0.092	0.408	0.628	4.308	4.898
	N(b)	1.180	1.701	1.647	1.761	2.360	48.961	54.586
	N(c)	0.094	0.122	0.147	0.148	0.148	0.148	0.148
- International Activities	N(b)	-	-	-	-	-	0.241	0.316
	N(c)	-	-	-	-	-	0.411	0.356
Grants-in-Aid								
- Academies and ANZAAS	N(c)	-	-	-	-	-	0.462	0.475
	S(c)	-	-	-	-	-	0.148	0.155
- 5th Generation Computer Development	N(c)	-	-	-	0.244	0.259	0.244	0.259
International Cooperation								
- Academies' Scientific Exchanges	^{S}N(c)	-	-	-	-	-	0.180	0.187
- Association for Science Cooperation in Asia	N(c)	-	-	-	-	-	0.024	0.026
- Bilateral Agreements (India, Japan, Mexico, China, USA, FRG, USSR)	$_S$N(c)	0.079	0.156	0.147	0.192	0.272	0.612	0.638
- Commonwealth Science Council	N(c)	-	-	-	-	-	0.080	0.052

($ million)		R&D					S&T (including R&D	
					Projected		Projecte	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
. Ionospheric Prediction Service	N(a)	0.006	0.009	0.006	0.004	0.003	0.051	0.08
	N(b)	0.085	0.111	0.089	0.104	0.115	1.475	1.67
. National NMR Centre	N(b)	0.093	0.048	-	-	-	-	-
. Patent Activities								
- Patent Office#	N(a)	-	-	-	-	-	0.589	0.67
	N(b)	-	-	-	-	-	15.722	18.60
	N(c)	-	-	-	-	-	0.136	0.14
- Contribution to International Patent Bodies#	N(c)	-	-	-	-	-	0.316	0.34
. Research Grants and Fellowships								
- ARGS Grants	N(b)	-	-	-	-	-	0.146	0.15
	N(c)	13.187	14.544	16.766	18.106	20.248	18.106	20.24
	S(b)	-	-	-	-	-	0.049	0.05
	S(c)	3.803	4.193	4.469	5.037	5.456	5.037	5.45
- National Research Fellowships Queen Elizabeth II Awards and Marine Science Grants	N(b)	-	-	-	-	-	0.087	0.08
	N(c)	2.906	3.040	3.239	5.839	7.821	5.839	7.82
	S(c)	-	-	0.055	0.388	1.017	0.388	1.01
. Space and Upper Atmosphere Activities								
- Space Projects	N(a)	-	-	-	-	-	0.012	-
	N(b)	-	-	-	-	-	0.128	0.14
	N(c)	-	-	-	-	-	-	0.06
. Commission for the Future	N(b)	-	-	-	-	-	0.166	0.59
Anglo-Australian Telescope Board (AATB)	N(a)	0.544	0.566	0.406	0.143	0.105	0.143	0.10
	N(b)	1.058	1.227	1.304	1.403	1.497	1.403	1.49
	N(c)	0.126	0.091	0.059	0.322	0.284	0.322	0.28
Australian Institute of Marine Science (AIMS)	N(a)	0.527	0.581	0.673	0.926	0.552	0.926	0.55
	N(b)	5.195	5.801	6.227	6.424	6.893	6.424	6.89

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
nmonwealth Scientific and Industrial Research Organization (CSIRO)##	N(a)	70.792	81.305	56.215	39.832	46.624	41.116	48.208
	N(b)	200.976	233.247	253.894	259.615	277.155	275.089	294.529
	N(c)	1.032	1.133	1.435	1.904	2.435	3.914	5.085
	S(a)	0.072	0.109	0.110	-	-	-	-
	S(c)	0.058	0.052	0.052	-	-	-	-
ional Standards Commission	N(a)	-	-	-	-	-	0.045	0.044
	N(b)	-	-	-	-	-	0.941	1.032
Total		314.305	366.088	366.334	364.644	396.680	487.866	553.352
s recoveries from patent lated charges#		-	-	-	-	-	(21.163)	(23.057)
s other DOS recoveries		-	-	-	(0.002)	(0.223)	(1.106)	(3.607)
al (Budget Sector t expenditure)		314.305	366.088	366.334	364.642	396.457	465.597	526.688
Commonwealth Non-budget Sector								
lo-Australian Telescope Board nds brought forward and er revenues)	N(b)	0.016	0.023	0.020	0.023	0.042	0.023	0.042
tralian Institute of Marine Science (AIMS)	N(a)	0.003	0.015	0.012	0.019	0.010	0.019	0.010
	N(b)	0.034	0.145	0.109	0.134	0.122	0.134	0.122
monwealth Scientific and Industrial Research Organization (CSIRO)##	$_{S}$N(a)	0.481	1.106	1.819	2.923	4.772	2.937	4.729
	$_{S}$N(b)	7.089	10.792	9.072	16.479	25.355	16.669	25.643

($ million)		R&D					S&T (including R&D)	
		81-82	82-83	83-84	84-85	Projected 85-86	84-85	Projected 85-86
National Standards Commission	a N( ) b	-	-	-	-	-	0.227	0.282
Total (Non-Budget sector)		7.623	12.080	11.032	19.578	30.221	20.012	30.378
Total (Direct Commonwealth funding)		321.928	378.168	377.366	384.223	426.901	485.609	557.066
C. Expenditure from other sources								
Department of Science								
. Australian Government Analytical Laboratories	N(a)	-	-	-	-	-	-	0.084
	N(b)	-	-	-	-	-	-	1.116
. National NMR Centre	N(b)	0.044	0.011	-	-	-	-	-
. Space and Upper Atmosphere Activities								
- Space Projects (U.S. contribution)	N(a)	-	-	-	-	-	0.243	-
	N(b)	-	-	-	-	-	2.506	2.625
	N(c)	-	-	-	-	-	9.346	8.460
. Bureau of Meteorology	N(b)	-	-	-	-	-	18.592	20.026
Anglo-Australian Telescope Board (U.K. contribution and other revenue)	N(a)	0.554	0.566	0.406	0.143	0.105	0.143	0.105
	N(b)	1.058	1.227	1.304	1.403	1.497	1.403	1.497
	N(c)	0.126	0.091	0.059	0.322	0.284	0.322	0.284

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
monwealth Scientific and Industrial Research Organization##	N(a)	1.825	2.657	5.683	5.186	4.990	5.195	5.003
	N(b)	25.109	29.164	27.272	35.380	38.005	35.524	38.152
Total (Other sources)		28.731	33.889	34.894	43.240	45.889	55.488	58.333
Total (A+B+C)		350.659	412.057	412.260	427.463	472.791	541.097	615.399

N Natural sciences and engineering S Social sciences and humanities

^{S}N Includes some social sciences and humanities

$_{s}N$ Includes small component of social sciences and humanities

(a) Intramural capital expenditure (b) Intramural current expenditure

(c) Extramural expenditure

# The activities of the Patent Office result in revenues to the Commonwealth. This amounted to $9.22m in 1979-80, $11.03m in 1980-81, $12.71m in 1981-82, $14.5m in 1982-83, $16.7m in 1983-84.

## Most of the scientific and technological service activities undertaken by CSIRO are integral with the Organization's research programs and have been included under the heading R&D. The following activities have, however, been identified as S&T (other than R&D) for the purposes of these tables: information, library, editorial, patenting, science communications, overseas aid and the servicing of Australia's standards of physical measurement. From 1985, some of the CSIRO activities included in B above, are financed by SIROTECH (see A.21.4 below) and should be classified as BE in Tables 1 and 2 of the Statement: however, at this stage, reliable data are not available.

A.21.1 DEPARTMENT OF SCIENCE

The Department has a broad policy role in relation to science and has administrative and operational responsibilities across a wide span of research, scientific, and service activities. These are described in detail under the following headings.

- Antarctic Activities

The importance of Antarctica to Australia lies in the data base it forms for meteorological and pollution studies, in the critical role the ice sheet plays in southern hemisphere and global atmospheric and oceanic circulations, in its marine life and potential mineral resources, and in the fact that Australia claims sovereignity over nearly one half of the continent's land mass.

The Antarctic Division of the Department of Science conducts research and administers, organises and provides logistic support for the Australian National Antarctic Research Expeditions (ANARE) which operate from three stations on the Antarctic continent and one on Macquarie Island. The stations support programs of scientific research in upper atmospheric physics, cosmic ray physics, glaciology, biology, medical science, geography, geology, geophysics and marine sciences.

The capital expenditure reflects also the continuing commitment to rebuilding all three Australian Antarctic stations.

- Australian Government Analytical Laboratories (AGAL)

AGAL provides essential services in analytical chemistry and microbiology to enable client government departments and other agencies to meet their responsibilities of protecting public health, collect revenue on imported goods, enforce laws against importation of illicit drugs of abuse and protect the good name of export foodstuffs. AGAL's operational laboratories are supported by a research and development group which is responsible for the development of new methods, quality assurance programs, management of reference chemicals and the provision of specialist technical services.

- Bureau of Meteorology

The Bureau of Meteorology provides the national meteorological service. This covers a broad spectrum of activities including observing and forecasting the state of the atmosphere throughout Australia and adjacent territories; issuing warnings of hazardous weather events; and publishing and promoting use of meteorological information. It also undertakes the research needed to maintain it as a viable modern service.

The Bureau of Meteorology Research Centre (BMRC) was established on 1 January 1985 to provide the main organisational framework for carrying out the research responsibilities of the Bureau of Meteorology. The Centre's role is to perform the functions of a national meteorological research agency and to provide R&D support for the operational and service functions of the Bureau.

In order to focus on major aspects of its research priorities, the BMRC is structured with six research groups: Mesoscale Modelling; medium-range Predictions; Long-range Forecasting; Aviation Meteorology; Data Analysis; and Tropical Meteorology.

objectives of the Research and Development Program are:

- to advance the science of meteorology;
- to develop an integrated comprehensive description and scientific understanding of Australian weather and climate;
- to solve specific problems in meteorology;
- to develop the application of meteorology to the needs of the Australian community;
- to support the operations and services of the Bureau.

ce January 1984 the Baseline Air Pollution Station (Cape Grim, Tasmania) has been rated by the Bureau of Meteorology. The station is part of a worldwide baseline itoring network sponsored by the United Nations and guided and coordinated by the World eorological Organization. The object is to monitor changes in atmospheric constituents determine whether man-made pollution is changing the atmosphere on a global scale and ther this in turn is changing the world's weather and climate.

Bureau of Meteorology also promotes Australia's role in international meteorological ivities, eg, operation of the World Meteorological Centre, Melbourne; participation in programs of the World Meteorological Organisation; and promotion of the transfer of nnology to developing countries.

Grants in Aid

Department disburses government grants-in-aid to a number of bodies. The grants to four learned Academies contribute towards the costs of their affiliation with overseas international organisations and general administration. The learned academies are the tralian Academy of Science, the Australian Academy of Technological Sciences, the demy of the Social Sciences in Australia, and the Australian Academy of Humanities. se grants have also assisted academies to participate in exchange programs with their nese counterparts. The grant to the Australian and New Zealand Association for the ancement of Science (ANZAAS) assists a number of young Australian scientists to attend Congresses of ANZAAS. There is no Congress scheduled in 1986. The 56th Congress of AAS will be held in New Zealand in January 1987.

nts-in-aid are also made to private industry to promote an Australian 5th Generation puter system capability. In particular:

- to improve the current PROLOG language,
- to develop an indexing scheme, a query optimisation scheme and integrity constraints for very large data bases,
- to design unification chips,
- to develop expert systems and expert systems work benches.

International cooperative arrangements in science and technology

ateral international agreements are an important source of support for the development science and technology in Australia. There is considerable activity under seven eements administered by the Department: the United States-Australia Agreement for entific and Technical Co-operation, the Federal Republic of Germany-Australia Science Technology Agreement, the India-Australia Science and Technology Agreement, the an-Australia Science and Technology Agreement, the China-Australia Science and nnology Agreement, the Mexico-Australia Science and Technology Agreement, and the R-Australia Science and Technology Agreement (more details are provided in endix C). Activities supported under the agreements include short-term visits (usually o six months) to plan or participate in cooperative research, seminars and workshops, information exchange projects.

The Department is responsible for managing Australia's involvement in the Association for Science Cooperation in Asia (ASCA). The Association exists to encourage scientific and technical co-operation among member countries with a view to promoting development in the region.

Australia contributes to the budget for the Commonwealth Science Council, a liaison body formed in 1946 to facilitate collaboration and exchange of information between Commonwealth scientists.

. Ionospheric Prediction Service (IPS)

The Ionospheric Prediction Service provides assistance and advice to radio communicators through the distribution of long-term operational and planning radio predictions, and to radio communicators, geophysicists and other users of the earth-space environment through short-term forecasts of the state of the sun, the earth's upper atmosphere and magnetic field.

IPS is concerned with two broad areas of research:

- studies of the Earth's upper atmosphere, ionosphere, and radio wave propagation through them. This is fundamental to radio communications, navigation and radio direction finding;

- knowledge of the development of solar activity regions, the propagation of solar disturbances through interplanetary space, and the effects of such disturbances on terrestrial communication, navigation and geophysical systems. This knowledge is central to the forecasting of terrestrial effects of solar activity.

. National Nuclear Magnetic Resonance Centre

The Centre was established in 1975 as an independent national research facility located within the grounds of the Australian National University. It helped Australian Research Grants Scheme grantees and other scientists to achieve results of national significance in the fields of chemistry, biochemistry, biology, geochemistry and medicine. Projects assisted include the manufacture of proteins, oil-from-coal research and development of new therapeutic drugs. The agreement between the Government and the A.N.U. terminated on 31 December 1982. Tenders were called for sale of the Centre's equipment and on 1 January 1983 ownership passed to A.N.U.

. Patent, Trade Marks and Designs Office

The Office:

- oversights and administers Australian industrial property systems for the protection of inventions, trade marks and industrial designs;

- investigates all applications for letters patent of invention and for the registration of designs and trademarks;

- issues Deeds of letters patent and certificates of registration and publishes details of successful applications;

- acts as a Receiving Office, International Searching Authority and an International Preliminary Examining Authority under the Patent Co-operation Treaty;

- provides and further develops patent information services to facilitate diffusion of technology by enabling access by research, manufacturing and industrial concerns to information contained in patent specifications; and

- contributes advice and expertise to other areas of the Department concerned with encouraging invention and technological innovation.

its recent review of the Australian patent system, the Industrial Property Advisory mmittee (IPAC) recommends that Australia continue to operate a patent system but that difications be made with a view to fostering indigenous innovation, developing export rkets, reducing social costs associated with patent monopoly rights and improving ministrative efficiency. The Committee's report, entitled 'Patents, Innovation and mpetition in Australia' was released for public comment. The report, its commendations, and the public comments received are under consideration.

e Office also contributes advice and expertise to other government departments and encies concerned with invention and technological innovation. In addition it provides licy advice to the Minister in relation to the development and administration of dustrial property laws, practices and procedures so that they may encourage innovation d creative activity for the national benefit. It is responsible for administering stralian participation in bilateral and multilateral international agreements and ntributes to various intellectual property bodies operating under the control of the rld Intellectual Property Organisation (WIPO), and also to the International Patent cumentation Centre, to facilitate the transfer of foreign patent information to the stralian Patent Office.

es charged for activities under the Patents, Trade Marks and Designs Act, and other venues largely exceed the cost of operating the Office (in the Ministry of Science Table ove such revenues have been offset against the Department's Budget Appropriation).

Research Grants and Fellowships

- Australian Research Grants Scheme (scientific research)

e Australian Research Grants Scheme (ARGS) supports high level research by individuals d research teams in universities and other non-government institutions. Grants are ovided on the basis of the quality of the proposed research and the ability of the vestigators. Scientific excellence is the sole criterion. Total amounts of $22.42m and 3.87m were allocated to individual research scientists and research teams for the lendar years 1984 and 1985 respectively under the ARGS. The number of individual grants creased from 1313 in 1984 to 1226 in 1985, showing a trend towards larger grants in pport of basic and applied research projects of exceptionally high quality. Grants are arded in eight disciplines - biological sciences (molecular), biological sciences (plant d animal), chemical sciences, earth sciences, engineering and applied sciences, physical iences, social sciences and humanities, and economics.

- National Research Fellowships

e Queen's Fellowships and Queen Elizabeth II fellowships schemes ceased to make new ards as from December 1984. These schemes have been subsumed into the National Research llowships Scheme. The new awards (which are the equivalent of the previous Queen's and een Elizabeth II fellowships) are to be known as the National Research Fellowships - een Elizabeth II Awards.

Up to 15 awards will be made annually with the first round of awards announced in October 1985. These awards will be made to young scientists of exceptional promise and proven capacity for original research in the areas of fundamental research, industry-based research and in priority areas of national interest such as:

- Research and development into products and processes, marketing, trade and social and legal issues concerning high technology areas such as:
    - energy technology
    - information technology and communications
    - materials technology
    - biomedical technology
    - biotechnology
    - raw materials processing
- Manufacturing technology
- Productivity
- Income, wealth and social inequality
- Social and economic issues affecting training and employment with particular regard to those affecting women and youth
- Occupational safety and health
- Social and economic implications of ageing
- Aboriginal Affairs
- Provision of services eg welfare, transport, health care
- Marine Sciences and Technologies.

Fellowships are for two years and may be taken up in industry, universities, colleges of advanced education or government research organisations in Australia.

In addition, a Marine Science Grant scheme supports research in the marine sciences and technologies in Australia to the sum of 3.7$m annually. This research is in recognition of Australia's rights and responsibilities over its marine environment and aims to provide a sound basis for the administration and management of our marine resources. Grants are available to individuals and research teams in universities or Government and non-Government research institutions.

Space and Upper Atmosphere Activities

ace Projects. The Department plays a central role in Australian space activities and in e operation of the NASA tracking stations and communication network in Australia under international agreement. In addition it accepted an American offer for an Australian ecialist to fly in a space shuttle mission. The proposed flight will occur early in 37.

Commission for the Future

e main aim of the Commission for the Future is to raise community awareness and derstanding of the social and economic impact of technological changes. Its terms of ference are:

To promote community awareness and understanding of developments in science and technology and their potential impact in Australia in the future.

To stimulate discussion and debate on the economic and social policy options available to Australian decision makers in responding to such developments.

To disseminate information about the implications of such developments - and related social and economic changes - for personal choices in education, career, leisure and related matters.

To prepare or commission studies, surveys, research reports and information dossiers on matters related to such developments.

To report annually to Parliament, through the responsible Minister, on past activities and projects of work programs.

A.21.2. ANGLO-AUSTRALIAN TELESCOPE BOARD (AATB)

e Anglo-Australian Telescope Board, jointly funded by the U.K. and Australia, maintains e 3.9 metre Anglo-Australian Telescope at Siding Spring, N.S.W. and associated cilities in Sydney. The Telescope is regarded world-wide as one of the most technically vanced optical telescopes, particularly in respect of its tracking accuracy and ectronic data acquisition and processing facilities. Refinements to the original stallation, new instrumentation development, and scientific and technical support staff the highest quality have maintained its place in the forefront of astronomical search. The Telescope is available to leading astronomers, principally from Australia the United Kingdom, to carry out research relating to all fields of astrophysics. The lescope is available by peer review of competitive proposals to astronomers from stralia, the United Kingdom and other countries, to carry out research relating to all elds of astrophysics.

e Anglo-Australian Observatory, the operating agency of the Anglo-Australian telescope ard, has continued to keep the Telescope in the forefront of astronomical research by oviding state-of-the-art instrumentation. During 1984-85 the following improvements ve been added to the equipment available to the scientists using the Telescope.

A charge coupled device (CCD) as an alternative detector on the RGO spectrograph: This detector extends the sensitivity to 10.8 micrometres and its low read-out noise makes it more sensitive than the photon-counting system at wavelengths longer than about 0.5 micrometres.

- The extension of the optical fibre system to the high dispersion camera of the RGO spectrograph: now the facility for obtaining up to 50 spectra at once through fibre plugged into an aperture plate at the Telescope's focus is available for observation at high as well as low spectral resolution.

- The addition of an infrared grating spectrometer for the study of infrared sources: the optics of this new instrument were provided by the Australian National Universit while the electronics for the 16-element array of indium antimonide detectors and th software were developed at the AAO. The sensitivity between 1 and 2.2 micrometres surpasses any similar instrument on other telescopes.

A.21.3. AUSTRALIAN INSTITUTE OF MARINE SCIENCE (AIMS)

The Australian Institute of Marine Science carries out research towards a predictive understanding of the systems and processes of the marine environment. The mandate grant to the Institute does not limit the topics or regions which may be the subject of its research. However, for the foreseeable future emphasis is placed on research on mangrov dominated coastlines, the Great Barrier Reef and adjacent waters. The Institute is situated near Townsville.

Organisationally, the search for understanding and predictive capability is administered under six major, cooperative, interdisciplinary programs whose details have been recentl developed in an extensive set of research proposals. The programs are:

- The Mangrove Program, which includes studies on the development of mangrove forests through time and the development of techniques for the determination of the age of forests.

- The Nearshore Environment Program, which seeks to understand the processes and troph interactions with the environment.

- The Coral Reef Metabolism Program: this program will provide the means to assess ho coral reefs respond to, and are controlled by their environments.

- The Coral Reef Ecology Program: this program is directed to characterising the patterns of coral reef communities in space and time, elucidating the factors which determine those patterns and to the production of explanatory and predictive models the ecosystem and its components.

- The Shelf Sea of the Great Barrier Reef Region: this research program aims to elucidate the major abiotic and biotic factors which influence the distribution and abundance of organisms within the Shelf Sea of the Great Barrier Reef Region; to evaluate the mechanisms governing the dispersal and recruitment of reef dwelling animals and to describe the responses of different systems within the region to temporal variations of nutrient concentrations in order to determine the importance upwelling events.

- Paleoenvironments and Coral Chronologies Program: this new program has been established to develop new discoveries on growth histories of massive corals which record environmental data invaluable to agriculture, engineering, weather forecastin and other related disciplines.

Apart from these six basic research programs, external funding has allowed the Institute to commence major research on the Crown-of-Thorns Starfish phenomena and to provide assistance to ASEAN countries to develop technologies for assessing their coastal marine resources especially mangroves and coral reefs.

A.21.4. COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION (CSIRO)

IRO was established as an independent statutory corporation by the Science and Industry search Act 1949. It succeeded the former Council for Scientific and Industrial Research tablished in 1926. The Act was substantially amended in 1978.

e main role of the Organization is to plan and execute a comprehensive program of neral scientific research on behalf of the Commonwealth for the benefit of Australian dustry and the community.

search is carried out mainly in the physical and biological sciences, with the emphasis strategic research. Strategic research is undertaken to achieve practical results and characterized by its emphasis on longer-term and broadly applicable studies.

e transfer of research results into commercial use or other applications is a principal n of CSIRO. Other activities are undertaken to the extent that they can be carried out nveniently in conjunction with the Organization's main research and technology transfer tivities.

IRO's statutory functions, in summary form, are:

- to carry out scientific research relevant to Australian industry, the community, national objectives, national or international responsibilities, or for any other purpose determined by the Minister;
- to encourage and facilitate the application and utilisation of research results;
- to undertake liaison with other countries in matters of scientific research;
- to train research workers;
- to make grants and award fellowships and studentships relevant to the Organization's research;
- to recognise, cooperate with and make grants to industrial research associations;
- to establish, and promote the use of, standards of measurement of physical quantities;
- to collect, interpret and disseminate scientific and technical information; and
- to publish scientific and technical reports, periodicals and papers.

e Organization is funded primarily by direct appropriations from the Commonwealth rliament. Decisions on research priorities are made by CSIRO in the light of advice ceived from the CSIRO Advisory Council, government departments, industry and other terested bodies.

IRO is governed by an Executive comprising three full-time members, one of whom is airman, and five part-time members. The Chairman is the chief executive of the ganization and is assisted in this role by the other two full-time members of the ecutive.

e research work of the Organization is carried out in five Institutes, each headed by a rector. Institutes are groupings of Divisions and Units with related research terests. The latter are headed by Chiefs and Officers-in-Charge respectively.

Divisions and Units are each responsible for coherent sets of research programs, with Units generally being responsible for narrower fields of research and having fewer staff than Divisions.

Support services are provided as follows:

- Planning	Assistance in setting research priorities and allocating resources.
- Scientific Services	Technology transfer, computing services, library and information services, and international aid.
- Corporate Secretariat	Corporate policies, coordination and development.
- Finance and Administration	Budget, works, administrative services and systems.
- Personnel	Policy advice and operational assistance in all staff matters.

On 30 June 1985, CSIRO had a total staff of 7 195 in more than 100 locations throughout Australia. About one-third of the staff were professional scientists, with the others providing technical, administrative or other support.

The CSIRO Advisory Council is supported by six State Committees and a Northern Territory Committee. The Council comprises the chairmen of its State and Territory Committees, senior representatives of Commonwealth agencies with interests in science and technology, and persons representing industry, tertiary education and community interests. ASTEC, th Australian Science and Technology Council, has observer status on the CSIRO Advisory Council.

CSIRO also has direct formal consultative links with Commonwealth ministries having major interests in science and technology, with industry bodies, and with the tertiary educatio sector.

The broad objectives, fields of research and composition of the five CSIRO research institutes are as follows:

. Institute of Animal and Food Sciences

The Institute comprises the following Divisions and Units:

Division of Animal Health
Division of Animal Production
Division of Fisheries Research
Division of Food Research
Division of Human Nutrition
Division of Tropical Animal Science
Division of Molecular Biology
Division of Fisheries Research
Australian Animal Health Laboratory.
Wheat Research Unit

The Institute conducts scientific and technological research aimed at improving the efficiency of livestock production, the management and productivity of Australia's fisheries resources, the conservation of its marine ecosystems, and the quality and safet of human foods; and at obtaining a better understanding of the relationships between huma diet and health.

e Institute's activities include research on:

- control of indigenous and exotic animal diseases;
- nutrition, reproduction, genetics and management of livestock;
- marine ecosystems and the ecology and population dynamics of the ocean's harvestable resources;
- methods of processing, handling and storing meat, fish, dairy foods, fruit, vegetables and grain;
- identification of nutritive imbalances and deficiencies in the diets of Australians and investigation of their effects on human health; and
- molecular and cellular biology and its application in the livestock and pharmaceutical industries.

Institute of Biological Resources

e Institute comprises the following Divisions and Unit:

vision of Entomology
vision of Forest Research
vision of Horticultural Research
vision of Plant Industry
vision of Soils
vision of Tropical Crops and Pastures
vision of Water and Land Resources
vision of Wildlife and Rangelands Research
ntre for Irrigation Research.

e Institute conducts scientific and technological research aimed at improving the
nagement and productivity of Australia's land, soil, water, agricultural, pastoral and
restry resources, and the management and conservation of Australian ecosystems.

e Institute's activities include research on:

- application of the plant sciences to the management and utilisation of crops, pastures, forests and native ecosystems;
- introduction, selection and breeding of plant material as a basis for developing new and improved varieties of crop and pasture plants and forest trees;
- control of insect pests of plants and animals, and of weeds and plant diseases, with particular emphasis on research aimed at reducing dependence on chemical control;
- biology of native and introduced animals in the context of conservation and pest control; and
- assessment and management of land, soil and water resources in agricultural, pastoral, forested and near-urban areas.

Institute of Energy and Earth Resources

The Institute comprises the following Divisions and Units:

Division of Energy Chemistry
Division of Energy Technology
Division of Fossil Fuels
Division of Geomechanics
Division of Groundwater Research
Division of Mineral Chemistry
Division of Mineral Engineering
Division of Mineral Physics and Mineralogy
Division of Minerals and Geochemistry

The Institute conducts and fosters scientific and technological research aimed at contributing to the better definition, use and management of Australia's mineral, energy and groundwater resources with due recognition of the environmental consequences of these activities.

The Institute's activities include research on:

- locating, evaluating, defining and characterising Australia's energy and earth resources; and

- planning their recovery, development and effective use, consistent with the minimization of environmental stresses.

. Institute of Industrial Technology

The Institute comprises the following Divisions:

Division of Applied Organic Chemistry
Division of Building Research
Division of Chemical and Wood Technology
Division of Manufacturing Technology
Division of Protein Chemistry
Division of Textile Industry
Division of Textile Physics.

The Institute conducts scientific and technological research and development aimed at increasing the efficiency, competitiveness and scope of Australian industry in relation to both national and international markets. Other objectives are to carry out research and transfer appropriate technology to the rural, manufacturing, and tertiary sectors of the economy. The Institute has special research interests related to:

- The manufacturing sector: Research into the improvement of existing products and processes and of new products and processes suitable to manufacture in Australia.

    - Processing of rural products, especially wool, wood, hides and skins.

    - Development of new projects and processes suitable for Australian manufacture for local and overseas markets.

    - Improving the competitiveness of Australian manufacturing industry.

The rural sector: Research into the application of industrial technologies to assist the rural industry in areas of plant production and animal health and with the marketing and processing of rural products.

. Objective measurement for marketing of raw wool.

. Grain protection.

. Chemicals and vaccines for plant protection and animal health.

The service sector: Development of technologies for various service industries with special interests.

. Water and waste water purification.

. Building and construction.

. Urban development.

Institute of Physical Sciences

Institute comprises the following Divisions and Units:

ision of Applied Physics
ision of Atmospheric Research
ision of Chemical Physics
ision of Environmental Mechanics
ision of Information Technology
ision of Materials Science
ision of Mathematics and Statistics
ision of Oceanography
ision of Radiophysics
craft Facility Unit

Institute conducts scientific and technological research in the physical, chemical and ematical sciences aimed at meeting the needs of Australian industry and the community erally. The research includes work directed to increasing understanding of the sical environment, and undertaken both in the national interest and in accord with the anization's obligation to contribute to the discharge of Australia's international entific responsibilities in areas such as astronomy, oceanography and the atmospheric ences.

The Institute's activities include research on:

- application of the physical sciences to industrial problems;
- maintenance of the national standards of measurement;
- development of scientific and industrial instrument techniques;
- properties of industrial materials and development of improved materials and chemical and physical processes;
- climate, weather and atmospheric transport of pollutants and other entities;

- physics of interactions between soil, water, plants and atmosphere;

- radiophysics and its application to astronomy, navigation and communication;

- the physical and chemical oceanography of the Australian marine environment, including air-sea interaction;

- application of mathematics and statistics to problems in industry and science; and

- development and application of advanced techniques in information technology.

. Commercial Activities

Policy

The main aim of CSIRO's commercial activities is to achieve the greatest possible social and economic benefit to Australia by contributing to commercially viable innovation. This requires research that can be exploited by Australian industry, or that will otherwise bring benefits to Australia, and the selection of commercial partners with the capability to develop, apply and market the innovation. Normally economic and social benefits will be maximised through establishing manufacturing or other activities in Australia based on the CSIRO innovation. The main benefit to the community comes from the resultant generation of wealth, employment and export income. At the same time, the CSIRO technology with the greatest potential to increase Australian industry's competitiveness will normally be that which industry is willing to pay most for - judged against the cost and profit structure of the sector of industry against the cost and profit structure of the sector of industry concerned. A secondary, but important, aim of CSIRO's commercial policy is to maximise CSIRO's revenue from its commercial transactions.

SIROTECH

SIROTECH Ltd was incorporated in 1984 and opened its doors for business on 2 January 1985. The company has a Board of senior business executives and is developing its own corporate policies and goals. Its business aims are to transfer scientific research results with sound commercial potential to industry capable of making the best use of those results to maximise the ultimate benefits to Australia.

During 1985 more than 130 projects were worked on and highlights were:

- Zirconia
  ICI and CSIRO's Division of Mineral Chemistry have been collaborating in the research and development of methods for the manufacture of zirconia. This project aims to establish a 'sunrise industry' in a market niche between the mining of zircon and the manufacture of PSZ.

- Herbicides and Insecticides
  The CSIRO Division of Applied Organic Chemistry has developed a series of lead compounds for herbicides and insecticides which exhibit properties superior to existing commercial projects. These products now require extensive screening to obtain approvals for use which will take some six years and cost some $50 million. SIROTECH has selected a company as the collaborator in this work and a new joint venture company with majority Australian ownership is being negotiated.

Scrimber

Scrimber, a process for the production of large dimension structural timber from small trees, was developed by the Division of Chemical and Wood Technology. SIROTECH has been responsible for negotiating an agreement with SATCO for the commercialisation of the existing technology.

SIROSMELT

CSIRO has developed a combustion-top entry lance smelting system called SIROSMELT. On behalf of CSIRO a licence was finalised by SIROTECH with a Brisbane-based company.

Conveyor Belt Monitor

A conveyor belt monitoring system was developed by CSIRO's Applied Physics Division for the monitoring of corrosion and breakage of steel cords in conveyor belts. An agreement has been signed for the licensing of the technology and the company has set up a service activity to test mining companies' conveyor belts.

Distribution of Research Effort

the table which follows, CSIRO research is grouped under a number of socio-economic adings developed specifically for the presentation of CSIRO's activities. The assification scheme was originally prepared for strategic planning purposes and contains jor sectors broken down progressively into sub-sectors and research areas. The scheme used in CSIRO to meet management and reporting needs and continues to evolve in line th changes in these requirements. The classification presented in this Statement presents a major revision from the classification presented in previous statements. As result, detailed comparisons with expenditures reported previously are not readily ssible and the table thus covers only 1984-85 and estimates for 1985-86.

second table has been prepared which presents year-to-year data by sectors to provide an dication of trends at this broad level only. Readers wishing to pursue more detailed ar-to-year comparisons are invited to contact CSIRO by writing to the Corporate cretary, CSIRO, PO Box 225, Dickson, ACT, 2602.

summary, the major changes to the classification scheme are:

the separation at sector level of resources devoted to the emerging new technologies of biotechnology, information technology and space technology to highlight the Organisation's effort in these areas;

the separation at sector level of resources specifically directed to international aid which had not been previously separately identified;

some reshaping of the sub-sectors, notably in the Conservation and the Natural Environment, Manufacturing Industries and Service Industries sectors; and

at research area level, a general redefining of the boundaries and titles to reflect better the purpose for which the research is undertaken, or the most direct Australian beneficiary or user.

ainst these socio-economic headings, the actual expenditure (or projected expenditure r 1985-86) is set out. These figures reflect all the funds which were spent by CSIRO, on its behalf by other agencies, in each financial year.

These total expenditure figures, which are made up of funds from a variety of sources, include:

- Budget appropriations for salaries, operating expenses and capital works.
- Funds received for research from Government departments and agencies (e.g. National Energy Research, Development and Demonstration Council).
- Funds raised by a levy on various primary producer groups and distributed by the Commonwealth Department of Primary Industry together with matching financial support (i.e. Rural Industry Research Funds).
- Other contributory funds for supporting particular research work in CSIRO.

. Comparisons of Annual Expenditure Figures

When comparing expenditures for various years account must be made for changes in the structure of funding which have occurred. In 1981-82 CSIRO became liable for the employer's share of superannuation ($26m in 1981-82, $29m in 1982-83, $32m in 1983-84 and $35m in 1984-85 and $36m for 1985-86) and for salary expenditure for an additional payday which fell in that year. Some sections of the Australian Atomic Energy Research Establishment at Lucas Heights transferred to CSIRO during 1981-82 and CSIRO provided associated expenditure for four months of that year.

Table 18. CSIRO EXPENDITURE BY RESEARCH SECTOR 1984 - 85 AND PROJECTED 1985-86

EXPENDITURE BY DETAILED RESEARCH SECTOR

($ million)	1984-85	Projected 1985-86
NUFACTURING INDUSTRIES		
chnology Based Manufacturing Industries		
Scientific and Electronic Equipment and Instrumentation	7.298	8.006
Chemical, Polymer, Pharmaceutical or Veterinary Products	14.258	15.642
Fabricated Metal Products and Processes	4.944	5.424
Machinery and Equipment	0.186	0.205
Not Specifically Allocated	1.031	1.132
Sub Total - Technology Based Manufacturing Industries	27.717	30.409
source Based Manufacturing Industries		
Food and Beverages	12.807	14.050
Textiles and Leather	7.545	8.277
Wood, Paper and Forest Products	4.452	4.884
Industrial Mineral Processing and Basic Metal Products	4.638	5.088
Sub Total - Resource Based Manufacturing Industries	29.442	32.299
nufacturing - General		
Generic Manufacturing Technologies	7.577	8.312
Advanced Materials	14.570	15.984
Not Specifically Allocated	0.375	0.412
Sub Total - Manufacturing General	22.522	24.708
Manufacturing Industries Not Specifically Allocated	1.537	1.685
TOTAL - MANUFACTURING INDUSTRIES	81.218	89.101

($ million)	1984-85	Projected 1985-86
RURAL INDUSTRIES		
Agriculture		
Cereal Crops	5.734	6.290
Oilseed and Legume Crops	3.145	3.450
Horticultural Crops	5.907	6.480
Fibre and Industrial Crops	10.539	11.562
Pastures	8.994	9.867
Sheep	4.522	4.961
Beef Cattle	7.666	8.410
Dairy Cattle	0.195	0.214
Intensive Livestock	0.231	0.253
Agricultural Systems	5.596	6.139
Multi Commodity Research	15.689	17.212
Not Specifically Allocated	9.717	10.660
Sub Total - Agriculture	17.935	85.498
Forestry		
Plantation Forests	5.198	5.703
Natural Forests	3.746	4.110
Bushfires	1.113	1.221
Not Specifically Allocated	0.238	0.261
Sub Total - Forestry	10.295	11.295
Fishing		
Fisheries	7.356	8.070
Marine Biology	3.008	3.300
Not Specifically Allocated	0.143	0.157
Sub Total - Fishing	10.507	11.527
Rural Industries - Not Specifically Allocated	2.470	2.710
TOTAL - RURAL INDUSTRIES	101.207	111.030

($ million)	1984-85	Projected 1985-86
RAL, ENERGY AND WATER RESOURCES		
eral Resources		
xploration	7.475	8.201
ining	2.396	2.629
inerals Beneficiation	6.634	7.278
ot Specifically Allocated	0.577	0.633
ub Total - Mineral Resources	17.082	18.741
gy Resources		
oal Production	3.926	4.307
oal Utilisation	7.856	8.619
etroleum, Natural Gas and Oil Shale	8.366	9.178
enewable Energy, Energy Storage, Conservation and Use	7.219	7.920
ot Specifically Allocated	0.455	0.499
ub Total - Energy Resources	27.822	30.523
r Resources		
ater Resource Management	10.681	11.718
ater Technology	2.054	2.252
ub Total - Water Resources	12.735	13.970
ineral, Energy and Water Resources - ot Specifically Allocated	2.296	2.519
OTAL - MINERAL, ENERGY AND WATER RESOURCES	59.935	65.753

($ million)	1984-85	Projected 1985-86
CONSERVATION AND THE NATURAL ENVIRONMENT		
Soils and Land Use		
Soils Resources	1.124	1.233
Land Use	1.841	2.020
Soil Conservation and Management	3.647	4.001
Not Specifically Allocated	2.151	2.360
Sub Total - Soils and Land Use	8.763	9.614
Ecology and Environment		
Aquatic Environment	3.518	3.859
Terrestrial Environment	3.582	3.930
Sub Total - Ecology and Environment	7.100	7.789
Flora and Fauna		
Flora	2.602	2.855
Fauna	8.289	9.094
Sub Total - Flora and Fauna	10.891	11.949
Oceans and Atmosphere		
Oceans	7.285	7.992
Atmosphere	6.011	6.594
Not Specifically Allocated	0.208	0.228
Sub Total - Oceans and Atmosphere	13.504	14.814
Astronomy		
Astronomy	11.822	12.970
Sub Total - Astronomy	11.822	12.970

($ million)	1984-85	Projected 1985-86
vironmental Protection		
Land	0.858	0.941
Water	0.943	1.035
Air	2.659	2.917
Human Environment	0.674	0.739
Sub Total - Environmental Protection	5.134	5.632
Conservation and the Natural Environment - Not Specifically Allocated	0.173	0.189
TOTAL - CONSERVATION AND THE NATURAL ENVIRONMENT	57.387	62.957
RVICE INDUSTRIES		
ban and Civil Engineering		
Transport Systems	0.418	0.459
Geo-Engineering	1.561	1.713
Construction	4.615	5.063
Urban Planning	0.803	0.881
Sub Total - Urban and Civil Engineering	7.397	8.116
alth		
Nutrition and Food Safety	5.428	5.955
Medical Technology	1.787	1.961
Sub Total - Health	7.215	7.916
ysical Standards		
Standards	0.975	1.070
Calibration Services	6.299	6.911
Sub Total - Physical Standards	7.274	7.981
Service Industries - Not Specifically Allocated	0.312	0.342
TOTAL - SERVICE INDUSTRIES	22.198	24.355

($ million)	1984-85	Projected 1985-86
MULTI-SECTORAL TECHNOLOGIES		
Biotechnology	36.922	40.505
Information Technology	11.336	12.436
Space Technology	4.525	4.964
TOTAL - MULTI-SECTORAL TECHNOLOGIES	52.783	57.905
INTERNATIONAL AID	5.714	6.269
TOTAL - ESTIMATED RESEARCH	380.442	417.370

B. SUMMARY DATA

($ million)	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	Projected 1985-86
Manufacturing Industries	46.596	49.818	55.893	77.976	87.819	90.757	93.786	102.921
Rural Industries	68.743	90.494	107.462	132.160	150.713	144.178	136.527	149.739
Mineral, Energy and Water Resources	24.220	28.582	36.913	51.165	62.608	62.991	62.039	68.089
Conservation and the Natural Environment	31.625	32.716	37.640	44.880	52.653	49.774	60.980	66.795
Service Industries	17.345	19.198	20.291	20.651	21.108	28.378	27.200	29.827
TOTAL	188.519	220.808	258.199	326.832	374.411	376.438	380.442	417.370

Executive periodically designates areas of research where growth will be specifically ouraged. Resources for this growth come mainly through redeployment of existing ources either specifically by limiting resources in one area to support growth in ther, or less specifically through the redirection of vacancies arising out of the mal processes of staff turn-over.

1985-86, the nominated growth areas are:

First priority:

- biotechnology;
- generic manufacturing technologies;
- information technologies;
- water and soils;
- space science and technology.

Second priority:

- plant diseases;
- human nutrition;
- raw material processing.

Biotechnology

technology covers the use of biological organisms in industrial processes and the etic modification of organisms to produce new plants and animals. It is aimed at more ective production techniques and new products in areas as diverse as food, fuels, rmaceuticals, chemical feedstocks, waste recycling and pollution control. Recombinant and cell manipulation techniques have provided the major impetus for the expansion of technology. They are used in a number of CSIRO research programs and are applicable to ers. A variety of agricultural applications of biotechnology are being researched; example, animal cell growth and development, gene technology, and the biological leecing of sheep through the use of epidermal growth factor. Other areas in which technology research is continuing include animal breeding, the molecular basis of plant rovement, understanding the mechanisms involved in the production of cell mutations, manufacture of vaccines, hormones and rare proteins, the conversion of lignocellulosic erials to high value chemicals and products, and the use of micro-organisms in ustrial processes.

Generic Manufacturing Technologies

ldwide there are moves in the industrialised countries to automate, integrate and trol manufacturing processes in the continuing search for greater efficiency, accuracy speed in manufacture. Underlying these moves are a number of advanced technologies ch are applicable to many industries and which are collectively called generic ufacturing technologies. They include such technologies as robotics, local area works, computer-aided design and sensing systems. An integrated manufacturing system ompasses the range of activities through design and planning to the actual manufactuing cesses, and such a system might embrace one or more of the generic technologies.

CSIRO research in this area is growing rapidly and is concentrated in the Division of Manufacturing Technology based in Melbourne. New research groups are being established Adelaide and Sydney. Current research programs include robotics and related technologie machine tool set-up and control, mechanical design and analysis aided by computer and local area networks.

- Information Technology

Information technology is emerging, not only as the basis of entirely new major industries, but also as an essential future component of those existing industries likel to survive past the end of the decade. CSIRO has a scientific and technological base in information technology in many of its Divisions. CSIRO is planning to redeploy additiona resources to this area for at least the next few years and an information technology program has been established. This program has three components: the collaborative projects between Australian industry, universities and other tertiary educational institutions and CSIRO Divisions, and the support of information technology related projects throughout CSIRO. This information technology program will result in co-ordinated effort in the areas of software technology and related hardware, man-machin interface, device and systems hardware technologies, information management and computer networking.

- Water and Soils

Australia has a larger proportion of shallow, infertile soils than any other continent, well as generally low and variable rainfall. CSIRO is conducting research on plant/soil/water relationships to develop principles for applications in both dry land a irrigated agriculture, forestry, hydrology, engineering and conservation. Within CSIRO there has recently been a redeployment of resources from research of lower priority to water resources research. Salinity and other aspects of water quality, groundwater and catchment hydrology have been identified as areas for expanded research effort. Other work includes testing of specially-adapted plant species; the requirements for and effect on water of industrial development; and water and waste-water treatment and purification processes.

- Space Science and Technology

Space-related technologies are rapidly assuming major significance around the world. The are seen by many countries to be necessary tools for the maintenance of strategic and commercial interests and as primary sources of modern technological innovation that invigorates existing industries. Spacecraft are becoming an integral part of national a international systems for communications, meteorology, resources management, surveillance remote sensing, navigation, search and rescue and national security. Continued financial commitment by Australia to such systems seems inevitable. CSIRO's space-related research forms an integral and important part of Australia's space activities and, in particular, provides an important source of innovation and intellectual content. CSIRO's space research program is intended to maximise industrial involvement and interaction with government instrumentalities and user agencies, and projects are selected on the basis of the following criteria:

(a) applications that will be utilised in Australia, providing manufacturing opportunitie in which a substantial local and export space products market can be generated,

(b) applications for which Australia must have substantial elements of control, international negotiations strength and technical competence in order to preserve its national interests, activities that would permit Australia to maintain the personnel and technologies it requires for the future, and

opportunities for building on existing competence in Australian government laboratories, universities and industry.

Plant Diseases

nt diseases result in losses of potential production ranging from plant death and crop lure to non-specific reduction in plant performance. Where chemicals are used for ntrol, costs are high and in some cases there are health risks. Overall, production sses and treatment costs are major factors in farm profitability. Following a recent iew of research needs in this area, and taking into account the work of other research anisations, principally in State departments of agriculture, CSIRO has identified the lowing areas of emphasis for the coming years:

ecular biology approaches

t diseases

pical plant diseases

logical control of weeds, and

ategic research on crop loss assessment and epidemiology.

lds under investigation within these areas include plant viruses particularly in stures and annual crops, soil-borne diseases, diseases of forest and woodland trees, eding of disease, pest and herbicide resistant plants, and diseases in new crops luding those suitable for tropical areas.

Human Nutrition

diovascular disease and cancer, both nutritionally-related disorders, account for 75% mortality in Australia and a high proportion of health care costs. Other diet-related seases such as obesity and diabetes account for much less mortality but have a high cidence in the community. In addition, the microbiological safety of food is a ntinuing public health problem. It is estimated that 2 million cases of food poisoning year occur in Australia and a wide range of bacterial species have been implicated in cent outbreaks of food poisoning.

ther research in these areas is needed so that:

national dietary guidelines can be refined and the best advice given to consumers;

appropriate government policies and regulations can be developed on food standards, supplements, additives, labelling and hygiene; and

agricultural, fishing and food industry policies can be directed towards food composition and adjustment of production to consumer trends.

- Raw Materials Processing

Australia has a rich endowment of natural resources which have a fundamental role in the economy, especially in the export sector; relatively inexpensive and abundant energy resources; a highly skilled workforce and a strong research capability. Raw materials processing is an important part of Australia's industrial activity, and a focus for structural adjustment of the Australian economy to products of higher added-value. Research within CSIRO is aimed at marketable products, or processes leading to them, particularly:

- minerals, metals and fossil fuels, including high intensity smelting, processes for non-metallic high value materials, high performance refactories, tantalum metal, carbon products from coal, and marketable liquid fuels from oil-shale and natural ga
- advanced materials such as high purity zirconia and rare earths;
- wood use, including reconsolidated wood, and natural fibre reinforced matrices;
- agricultural products, including food processing technology, wool processing to 'tops', and increased local processing to tanned or finished leather or sheepskins.

- Other Initiatives

The Government has approved the commencement of work for improvements to the CSIRO site Floreat Park, Perth. At an estimated cost of $8m the improvements will provide new accommodation for the Organisation's Laboratory for Rural Research and refurbishing of existing laboratories for the Division of Minerals and Geochemistry and the Division of Groundwater Research.

A.21.5. NATIONAL STANDARDS COMMISSION (NSC)

The National Standards Commission's main function under the National Measurement Act, 1960, is to promote and coordinate the use of a uniform system of units and standards of measurement of physical quantities, throughout Australia, including use of the metric system, and to advise the Minister on matters relating to Weights and Measures.

The Commission is also responsible for the approval of patterns of measuring intruments used for trade in Australia.

A.22. SOCIAL SECURITY

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
. Commonwealth Budget sector net expenditure								
epartment of Social Security Welfare Research	S(c)	0.550	0.594	0.678	0.678	0.678	0.678	0.678
Total (Direct Commonwealth funding)		0.550	0.594	0.678	0.678	0.678	0.678	0.678

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure		

A.22.1. DEPARTMENT OF SOCIAL SECURITY

Welfare Research

ne Department funds a Social Welfare Research Centre at the University of NSW. A new greement provides for continuation of the Centre for 5 years from 1 January 1985. ojectives of the Centre are:

- to undertake and sponsor research on social welfare issues in Australia;
- to provide opportunities for post-graduate studies on social welfare issues;
- to arrange seminars to foster understanding of social welfare issues; and
- to arrange for the publication of the results of research and studies carried out in or under the aegis of the Centre.

A.23. SPECIAL MINISTER OF STATE

($ million)		R&D					S&T (including R&D)	
						Projected		Projected
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of the Special Minister of State								
. Support for International Congresses and Other Grants-in-Aid	N(c)	-	-	-	-	-	0.049	0.100
	S(c)	-	-	-	-	-	0.050	0.120
National Police Research Unit	sN(a)	-	0.029	0.023	0.006	0.003	0.006	0.003
	sN(b)	-	0.040	0.132	0.181	0.200	0.181	0.200
	sN(c)	-	-	0.006	0.015	0.019	0.015	0.019
Australian Federal Police . Forensic Research	N(a)	0.018	0.327	0.051	0.069	0.047	0.078	0.047
	N(b)	0.011	0.010	0.073	0.022	0.028	0.067	0.075
	N(c)	0.194	0.105	0.122	0.137	0.095	0.137	0.095
Total (Direct Commonwealth Funding)		0.223	0.512	0.407	0.430	0.392	0.583	0.660
B. Expenditure from other sources								
National Police Research Unit (State funding)	N(a)	-	0.059	0.046	0.012	0.006	0.012	0.006
	N(b)	-	0.081	0.265	0.361	0.401	0.361	0.401
	N(c)	-	-	0.012	0.030	0.038	0.030	0.038
Total (Other sources)		-	0.139	0.323	0.404	0.445	0.404	0.445
Total (A+B)		0.223	0.651	0.730	0.833	0.837	0.986	1.105

N Natural sciences and engineering   S Social sciences and humanities
sN Includes small proportion of social sciences and humanities

(a) Intramural capital expenditure   (b) Intramural current expenditure
(c) Extramural expenditure

A.23.1. DEPARTMENT OF THE SPECIAL MINISTER OF STATE

rough appropriations to the Department of the Special Minister of State, the nmonwealth provides grants to national organisations and international conferences held Australia, some of which are of a scientific or technical nature.

A.23.2. NATIONAL POLICE RESEARCH UNIT (NPRU)

agreement to set up the NPRU was signed by members of the Australian Police Ministers' ncil in May 1982. The agreement provides for the Commonwealth to pay one-third of the ts of the NPRU and the other two thirds to be paid by the participating States and ritories. The Unit's objectives are to maximise the utilisation of academics and ognised specialists in research projects approved by the Board of Control, and to ilitate the "Interstate Professional Experience Award" Scheme to encourage greater eraction of policy specialists within the Australian police community.

A.23.3. AUSTRALIAN FEDERAL POLICE (AFP)

Scientific Research Directorate

AFP's scientific research program is related to AFP objectives and priorities. It is ducted by commissioning work to external agencies possessing specialist expertise and ources, and by conducting a number of major projects on an "in house" basis. All jects are concerned with the application of scientific techniques to law enforcement blems, with a view to improving the efficiency of police operations. Funds are loyed for salaries of external specialists, equipment, consumables and travel; aging of consultants in support of "in house" projects is also undertaken. External jects supported in 1984-85 were: Latent Fingerprint Development Techniques (ANU), osives and Post Blast Analysis (SA Forensic Science Centre), and Forensic Odontology iversity of Adelaide). "In house" projects involved forensic image processing by puter and remote sensing techniques for cannabis plantation detection.

A.24. TERRITORIES

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Territories								
. National Botanic Gardens	N(a)	0.002	0.010	0.005	0.004	0.008	0.979	0.93
	N(b)	0.194	0.232	0.349	0.323	0.348	2.759	2.96
. Other	N(a)	0.001	-	-	-	-	0.045	0.05
	N(b)	0.022	-	-	0.040	-	1.077	1.14
	S(b)	0.092	0.103	0.119	0.133	0.138	0.320	0.36
National Capital Development Commission	N(b)	0.003	0.002	0.003	0.00&	0.00&	0.06&	0.06
	N(c)	0.009	0.020	0.020	0.02&	0.02&	0.17&	0.21
	S(b)	-	-	-	-	-	0.63&	0.90
	S(c)	-	-	-	-	-	0.08&	0.22
Total (Budget sector)		0.323	0.367	0.496	0.523	0.517	6.262	6.87
B. Commonwealth Non-Budget Sector								
Department of Territories								
. A.C.T Forestry Trust Account	N(b)	0.030	0.010	0.035	0.015	0.060	0.205	0.26
	N(c)	-	-	-	-	-	0.003	0.02
Total (Non-budget sector)		0.030	0.010	0.035	0.015	0.060	0.208	0.28
Total (Direct Commonwealth funding)		0.353	0.377	0.531	0.538	0.577	6.470	7.16
C. Expenditure from other sources								
Department of Territories								
. National Botanic Gardens	N(b)	0.007	0.007	0.009	0.009	0.009	0.009	0.00
Total (Other sources)		0.007	0.007	0.009	0.009	0.009	0.009	0.00
Total (A+B+C)		0.361	0.384	0.540	0.547	0.586	6.479	7.17

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure	&	DoS estimates

A.24.1. DEPARTMENT OF TERRITORIES

he Department of Territories is responsible for the administration of the Australian apital Territory, the Jervis Bay Territory, the Territory of Cocos (Keeling) Islands, the erritory of Christmas Island, the Coral Sea Islands Territory and the Territory of shmore and Cartier Islands, and for Commonwealth responsibilities on Norfolk Island. The epartment's involvement in science and technology is mainly limited to management riented activities such as the management of wildlife populations, forests, parks, nature eserves and rural land.

he Wildlife and Conservation Unit carries out S&T programs:

to survey the plant and animal species which occur in the ACT and Jervis Bay Territory, including the aquatic organisms of the regional waters;

to assess the change in water quality with the development of the local waterways.

he data collected will be used to better manage the resources on reserved and open land nd waters of the ACT and Jervis Bay Territories.

chievements: A vegetation map of Tidbinbilla Nature reserve has been produced and on ssociated request is in preparation; a vegetation map of the Naas/Gudgenby catchment is n preparation, as are internal reports on the distribution of the broad-toothed rat and he brush-tailed wallaby in the ACT.

he Weights and Measures Office has the objective to ensure equity in trade. Its ctivities are therefore directed towards accurate trade measuring instruments and ccurate measuring practices.

he Welfare Branch collects data and compiles statistics on various social welfare ctivities for management purposes, policy formulation, monitoring of activities, rovision of information in relation to research and projects and also for inclusion in he National Welfare Statistical Collection (WELSTAT).

he Housing Branch administers the Government's rental housing and housing finance ssistance schemes in the ACT and carries out research to identify housing needs of the CT population.

Horticultural Services Unit

anberra as a planned city is renowned for its tree-lined streets and a substantial rovision of public open space including landscaped parks, school grounds and portsfields. Despite the harshness of the environment, Canberra probably has the largest ange of urban tree species of any major city in the world. This has required a high tandard of horticultural practice in development and maintenance. With increasing ecreational activity and increasing labour costs, maintenance of this standard has only een possible as a result of increased efficiencies and the use of improved materials. his has necessitated a City Parks Administration commitment to an ongoing programme in he areas of plant introduction, plant breeding, plant propagation, pest and disease ontrol, turf selection and management and aquatic weed growth and management aimed at the evelopment and/or selection of new plant species, machinery and procedures suited to the orticultural and parks management situation to be found in Canberra.

- National Botanic Gardens

The National Botanic Gardens has assembled, and continues to develop, a national collection of Australian and related floras for the purpose of education and display, scientific study, recreation and conservation.

The Gardens is a centre for research into the botany and horticulture of the Australian flora. Current projects include germination and cultivation of Australian terrestrial orchids with emphasis on endangered species, in-vitro micropropagation and the introduction and propagation of rare and endangered species.

- Australian Capital Territory Forestry Trust Account

The ACT forests are administered by the Forestry Branch of the Department. Forest activities are run as a business undertaking with commercial, conservation and amenity objectives and are funded by the ACT Forestry Trust Account. The Branch is researching environmental factors affecting plantation development and the effects of fire on catchment management.

A.24.2. NATIONAL CAPITAL DEVELOPMENT COMMISSION (NCDC)

The NCDC is responsible for the planning, design and construction of the city of Canberra as the National Capital of Australia. Current R&D or S&T activities are:

- review of Air Quality Study - Monitoring Program, which has been undertaken since 1983-84, in order to produce relevant data for analysis of current air quality problems in Canberra and prediction of future pollution levels;

- air quality monitoring;

- survey of sites of ecological significance in the ACT, in 3 stages commenced in 1983-84, 1984-85 and 1985-86 respectively;

- ornithological studies of the Museum of Australia site (completed in 1984-85), and a similar survey of the Murrumbidgee River Corridor commenced in the same year;

- various environmental impact assessments for specific projects;

- a research project into native grasses funded by the NCDC and undertaken by the CSIRO Plant Industry Division (A.21.4);

- provision of economic, demographic and social information and analyses to support NCDC operations primarily in: economic development, population forecasts, demographic assessment, and specific industry studies (such as retail, manufacturing, land and housing, building and construction, etc);

- traffic noise monitoring and data analysis;

- interpretation of data and consideration of measures to reduce noise problems;

- development of computerised noise model for analysis of data and prediction of future noise levels;

- development of a computerised Noise Database;

- various archaeological surveys, where results have been incorporated into the planning process; this work is continuing in 1985-86.

A.25. TRANSPORT

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
. Commonwealth Budget sector net expenditure								
epartment of Transport								
Marine Navigational Aids	N(a)	-	0.002	-	-	-	0.016	0.016
	N(b)	-	0.013	-	-	-	0.010	0.012
	N(c)	-	-	-	-	-	0.001	-
Office of Road Safety:								
- Emissions research	N(a)	0.005	0.008	0.005	-	-	-	-
	N(b)	0.007	0.012	0.017	-	-	-	-
- Road Safety	S(b)	0.060	0.150	0.301	0.314	0.165	0.314	0.330
	S(c)	0.149	0.208	0.233	0.113	0.262	0.826	0.853
Grants for Transport Planning and Financial Assistance	N(c)	1.470	1.664	1.395	1.057	0.281	1.890	1.114
	S(c)	0.158	0.191	0.198	0.554	0.554	0.710	0.710
ureau of Transport Economics	S(a)	-	-	0.007	0.008	0.007	0.091	0.172
	S(b)	-	-	0.124	0.138	0.134	3.167	3.075
	S(c)	-	-	-	-	-	0.086	0.100
	N(c)	0.010	0.004	-	-	-	-	-
Total (Direct Commonwealth funding)		1.859	2.251	2.280	2.182	1.403	7.111	6.382

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure		

A.25.1. DEPARTMENT OF TRANSPORT

- Grants to Transport Research Bodies

  - Australian Rail Research and Development Organisation (ARRDO)

    ARRDO is a national railway research organisation established in 1977 under the auspices of the Australian Transport Advisory Council, and is jointly supported by the Commonwealth and State Government-owned rail systems of Australia. ARRDO's work program concentrates on the financial, operational and managerial problems of Australian railways. The aim is to provide a basis on which a "national corporate plan" for railways can be developed.

  - Australian Road Research Board (ARRB)

    ARRB was established in 1960 by the National Association of Australian State Road Authorities as a national centre for road research. The Australian Land Transport Program 1984/85-1986/87 is based on the following topics:

    - Collection of information on road travel and vehicle ownership (4.6%).
    - Collection of information on freight (3.9%).
    - Testing of traffic loads (2.5%).
    - Testing heavy vehicles performance (4.4%).
    - Development of hydrological standards for bridges and culverts (1.2%).
    - Testing of materials (7.1%).
    - Testing of bituminous binders (5.8%).
    - Standards of design for residential street pavements (7.7%).
    - Accelerated loading pavement trials (11.8%).
    - Establishment of standards for control of construction procedures (2.2%).
    - Setting of standards for pavement design and performance (8.2%).
    - Research on traffic operators and road design standards (9.3%).
    - Research on road user information and guidance (6.9%).
    - Research on road user behaviour (5.2%).
    - Research on urban road system management (7.1%).
    - Supply of instruments (4.3%).
    - International cooperation activities (1.3%).
    - Information activities (6.5%).

Figures in brackets indicate percentage of total expenditures.

Marine Navigational Aids

e Department has an obligation to provide marine navigational aids in accordance with e requirements of enabling legislation, as described in a Forward Five-Year Plan dorsed by the Maritime Services Advisory Committee-Navigational Aids and in response to ligations under the Australian Heritage Commission Act 1975. Research and development nctions are undertaken to ensure the provision, review and upkeep of the most effective sual, audio and electronic aids, preparation of tidal prediction for shipping channels d associated activities. The development of microprocessor-based telemetric tide gauges suit Australian conditions is due for completion/commissioning in 1985-86.

Road Safety Division

e goals of the Federal Office of Road Safety research program are:

To support the policy activities of the office.

To support fundamental research which is likely to result in new knowledge and new road safety countermeasures; and

To share in smaller research projects being conducted in the States and Territories which could have national value.

e Federal Office of Road Safety has a number of policy issues in train which are sidered to warrant research support; eg, graduate licensing; speed limit ionalisation; and continued development of the National Mass Data System on road shes. Major records projects currently under way or proposed include:

development of a national road casualty data system,
studies of road user behaviour,
investigation of the influence of alcohol and other drugs on driving performance,
investigation of hazardous road locations (investigation into traffic modification techniques to improve road safety);
analysis of rural road crashes.

A.25.2. BUREAU OF TRANSPORT ECONOMICS (BTE)

Federal Bureau of Transport Economics (BTE) is a professional research body which orts directly to the Minister for Transport on its program of research work. For inistrative purposes the Bureau is attached to the Department of Transport. The Bureau responsible for independent economic research into Australian transport systems. Work undertaken in such areas as applied economics, engineering, system analysis, sociology other social or physical sciences.

BTE analyses the nature, capacity, performance and financing of transport systems. It o investigates the economic and resource allocation implications of such systems.

ther, the BTE undertakes:

- analysis of the effects of specific pricing and regulatory policies, (including methods of rate and fare setting);

- evaluation of transport investment proposals and programs;
- collection, analysis and dissemination of information relating to transport activities;
- development of economic evaluation methods, transport planning procedures and operations research techniques; and
- application of inter-disciplinary approaches to analysis of transport problems.

The BTE has a secondary function of assisting State and local governments, Commonwealth and State instrumentalities and the private sector to identify and address transport problems.

Other functions of the BTE cover research into all modes of transport. The types of topics addressed by the organisation range widely in both nature and scope. Accordingly, it is common for the Bureau's research program at any particular time to exhibit a high degree of diversity. Although the research program can be analysed in a number of ways, the major practical division relates to the sources of particular projects. In this context, the work of the BTE tends to fall into four general categories:

- major projects referred to the BTE by the Minister for Transport;
- projects developed by the BTE in consultation with the Department of Transport and the Department of Aviation, other Commonwealth departments and other agencies (such as Commonwealth-State councils and industry advisory bodies);
- ongoing commitments to information collection and dissemination. BTE-sponsored conference, workshops and similar activities; and
- mainstream internally-generated background studies aimed at providing the technical basis for the above activities.

A.26. TREASURY

($ million)		R&D					S&T (including R&D)	
					Projected		Projected	
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
. Commonwealth Budget sector net expenditure								
epartment of the Treasury								
Balance of Payments	S(a)	0.002	0.001	-	-	-	-	-
	S(b)	0.020	0.005	-	-	-	-	-
Econometric Modelling	S(b)	0.083	0.074	0.060	0.053	0.090	0.053	0.090
stralian Bureau of Statistics*	nS(a)	0.128	0.402	0.083	0.582	0.178	9.948	2.594
	nS(b)	3.758	5.678	4.250	6.096	7.933	107.826	120.032
Total (Budget Sector)		3.991	6.160	4.393	6.730	7.801	117.827	122.717
Less recoveries from ABS charges		-	-	-	-	-	(0.912)	(1.202)
Total (Direct Commonwealth Funding, excluding FE)		3.991	6.160	4.393	6.730	7.801	116.915	121.515
Financial Enterprises Sector								
mmonwealth Bank FE	N(c)	0.018	0.018	0.008	0.013	0.010	0.020	0.017
	S(a)	-	-	-	-	-	0.687	0.771
	S(b)	-	-	-	-	-	0.022	0.025
eserve Bank of Australia FE								
Grant Schemes								
- Rural Credits	N(c)	1.990	1.721	2.509	2.681	2.850	2.681	2.850
- Economic and Financial Research	S(c)	0.155	0.178	0.205	0.225	0.225	0.225	0.225
Studies of Australian financial system	S(b)	0.304	0.175	0.190	0.152	0.303	0.551	0.742
Special Projects	N(a)	-	-	4.227	1.445	1.185	1.445	1.185
	N(b)	-	-	-	1.162	1.619	1.162	1.619
	N(c)	-	-	-	0.095	0.115	0.095	0.115
Total (Financial Enterprises sector)		2.467	2.092	7.139	5.773	6.307	6.888	7.549
Total (Direct Commonwealth funding including FE)		6.458	8.252	11.531	12.616	14.108	123.915	129.064

N	Natural sciences and engineering	S	Social sciences and humanities
(a)	Intramural capital expenditure	(b)	Intramural current expenditure
(c)	Extramural expenditure	nS	Social science and humanities with a component of natural science and engineering
FE	Commonwealth financial enterprise		

A.26.1. DEPARTMENT OF THE TREASURY

- Balance of Payments Section

Investigates issues related with the balance of payments, exchange rate, current account balance and international competitiveness.

- Modelling Section

The Section is developing and validating an econometric model of the Australian economy which is intended for use in short-term forecasting and policy analysis within the Treasury. Treasury's interest in forecasting is directly related to its macroeconomic policy advising role and is thus concerned with all aspects of the aggregate economy.

A.26.2. THE AUSTRALIAN BUREAU OF STATISTICS (ABS)

The ABS is the central statistical authority for Australia. It provides statistical services for the Government and private sectors by collecting, compiling, analysing and disseminating social, demographic and economic statistics and related information. In addition, the ABS coordinates statistical operations of official bodies to ensure attainment of statistical compatibility and integration, avoidance of duplication, compliance with standards, and maximum utilisation of information. The Bureau also provides advice and assistance on statistical matters.

All ABS activities are regarded as S&T activities (predominantly data collection in the social sciences, with a minor R&D component, particularly in the Economic Services and Welfare areas).

A.26.3. COMMONWEALTH BANKING CORPORATION

The Commonwealth Banking Corporation was established under legislation enacted by the Australian Parliament and comprises the Commonwealth Trading Bank of Australia, the Commonwealth Savings Bank of Australia and the Commonwealth Development Bank of Australia and their subsidiary and associated companies. Current research projects are directed towards increasing efficiency of banking operations through increased computerisation and mechanisation; and, in the agricultural field, towards control of flystrike in sheep, and testing gains in cattle weight from different feed programs.

A.26.4. RESERVE BANK OF AUSTRALIA

The Reserve Bank of Australia is involved in the following scientific and technological activities:

- research into the Australian financial system using econometrics and other analytical methods;

- through its Economic and Financial Research Fund, the Bank assists post-graduate research outside the Bank into economic and financial topics relevant to Australia;

- grants are awarded from the Rural Credits Development Fund for research, development or extension projects directed towards the promotion of primary production. The main recipients of grants are universities, State departments of agriculture and the CSIRO. Sixty grants totalling about $2.4m were allocated in 1984-85 from the Rural Credits Development Fund for projects to be undertaken over the next three years. They included projects associated with salinity, the application of electronics to the management of animal production, new fishing and crop industries and animal and plant genetics;

- A project (CNRD) has been initiated, aimed at developing a more secure and cost-effective banknote.

A.27. VETERANS' AFFAIRS

($ million)		R&D					S&T (including R&D
						Projected		Projecte
		81-82	82-83	83-84	84-85	85-86	84-85	85-86
A. Commonwealth Budget sector net expenditure								
Department of Veterans' Affairs								
. Central Development Unit	N(a)	-	-	-	-	-	0.01&	0.01
	N(b)	-	-	-	-	-	0.18&	0.18
. Central Medical Research Advisory Committee	N(a)	0.040	0.040	0.048	0.04&	0.05&	0.04&	0.05
	N(b)	0.280	0.357	0.324	0.39&	0.39&	0.39&	0.39
. Repatriation Hospitals Pathology Services	N(a)	-	-	-	-		0.22&	0.22
	N(b)	-	-	-	-	-	11.20&	11.20
Total (Direct Commonwealth funding)		0.320	0.397	0.373	0.44&	0.44&	12.07&	12.06

N Natural sciences and engineering S Social sciences and humanities

(a) Intramural capital expenditure (b) Intramural current expenditure
(c) Extramural expenditure & DoS estimates

A.27.1. DEPARTMENT OF VETERANS' AFFAIRS

- Medical Research Grants

To encourage, facilitate, assess and coordinate medical research in the Department a Central Medical Research Advisory Committee (CMRAC) has been established. Based on the recommendations of this committee and subject to the required ethical safeguards being observed, the Department provides financial support to medical research proposals submitted by Departmental Officers. The objectives of the various research projects broadly cover three areas - establishment of techniques for medical investigative procedures, comparative studies of alternative treatment regimes and evaluation of rehabilitative methods.

. Central Development Unit

The Unit follows a continuous program of improving artificial limbs and surgical appliances. The program includes assessment of materials and components use, testing of new materials and components, development of improved methods of fitting artificial limbs, evaluation and adoption of the results of overseas research, dissemination of information, education and treatment of problem cases.

. Pathology Laboratories

As part of its service to veterans and their dependants, the Department of Veterans' Affairs operates Pathology Laboratories to provide pathology services for its Repatriation General Hospitals. Expenditure for this activity rose from about six million in 1979-80 to a projected eleven and half million in 1985-86.

DISSECTIONS OF AGGREGATE EXPENDITURES

B.1 R&D Expenditure by Socio-economic Objective

Table 19: Intramural Commonwealth Government expenditure on R&D in the natural sciences and engineering by socio-economic objective

($m)

Objective Category		1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	Projecte 85-86
National security								
. Defence	(a)	9.40	7.93	8.27	15.74	17.75	22.65	19.30
	(b)	75.65	89.73	94.38	97.64	102.55	109.23	113.56
Economic development								
. Agriculture	(a)	31.71	41.83	45.94	48.24	17.76	12.73	9.96
	(b)	39.14	42.94	55.09	59.35	73.16	87.81	96.56
. Other primary industries	(a)	1.55	0.74	1.85	2.69	6.28	1.17	1.33
	(b)	10.97	11.71	14.73	15.82	17.54	19.15	20.98
. Mining	(a)	1.51	2.19	2.90	2.79	2.94	2.34	2.86
	(b)	10.78	13.72	20.04	17.53	19.23	20.07	21.99
. Manufacturing	(a)	5.99	5.89	9.65	8.76	6.49	10.76	13.89
	(b)	32.33	40.43	51.87	56.42	45.72	61.36	66.80
. Construction	(a)	0.76	0.53	0.51	0.55	0.51	0.88	1.19
	(b)	6.06	6.08	7.07	7.63	7.62	9.20	10.18
. Energy	(a)	3.55	4.30	5.50	7.98	7.55	9.02	7.05
	(b)	22.35	27.76	37.47	48.49	45.49	41.45	45.41
. Transport	(a)	0.76	0.81	0.71	0.39	0.41	0.40	0.40
	(b)	0.38	0.32	0.28	0.35	0.33	0.30	0.30
. Communications	(a)	2.2	8.1	6.3	4.8	4.9	3.8	7.1
	(b)	25.1	27.7	31.6	37.1	36.8	41.6	48.0
. Economic services n.e.i.	(a)	0.59	1.01	1.75	1.36	5.21	3.29	5.01
	(b)	5.04	5.99	8.99	10.74	11.37	18.10	20.12
Sub-total	(a)	48.6	65.4	75.1	77.5	52.0	44.5	48.8
	(b)	152.1	176.7	227.1	253.4	257.2	299.0	330.3
Community welfare								
. Urban and regional planning	(a)	0.11	0.08	0.06	0.10	0.13	0.19	0.15
	(b)	1.33	1.08	1.60	1.87	2.14	2.13	2.32
. Environment	(a)	3.16	2.82	3.74	6.15	3.50	2.24	3.73
	(b)	14.19	14.88	20.10	29.72	27.30	27.35	29.88
. Health	(a)	2.67	2.45	1.64	2.78	3.59	2.80	3.34
	(b)	12.53	13.57	14.75	18.87	20.05	23.79	25.56
. Education		-	-	-	-	-	-	-
. Welfare		-	-	-	-	-	-	-

jective Category		1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	Projected 85-86
		($m)						
Community services n.e.i.	(a)	0.01	-	0.02	0.36	0.07	0.08	0.05
	(b)	0.24	0.22	0.01	0.05	0.21	0.21	0.23
ub-total	(a)	5.95	5.34	5.45	9.39	7.30	5.30	7.28
	(b)	28.29	29.75	36.46	50.51	49.69	53.48	57.99
dvancement of nowledge								
Earth, ocean and atmosphere	(a)	1.86	1.74	6.43	16.64	19.41	13.22	11.23
	(b)	16.03	22.86	35.77	41.17	45.69	45.89	50.81
General advancement of knowledge	(a)	5.63	5.26	1.25	2.39	4.13	4.25	14.61
	(b)	14.68	17.42	10.47	17.68	28.37	13.80	15.44
Sub-total	(a)	7.48	7.00	7.69	19.04	23.55	17.47	25.84
	(b)	30.71	40.28	46.24	58.85	74.07	59.69	66.05
otal	(a)	71.4	85.6	96.5	121.7	100.6	89.8	101.2
	(b)	286.8	336.4	404.2	460.4	483.5	521.4	567.9

OTE: Expenditures from other sources (A.1) are not included in this table; ie, only irect Commonwealth funding is included.

Table 20: Extramural Commonwealth Government expenditure on R&D in the natural sciences and engineering by socio-economic objective

Objective Category	1979-80	1980-81	($m) 1981-82	1982-83	1983-84	1984-85	Projected 85-86
National security							
. Defence	0.37	0.40	0.74	1.05	0.91	1.12	1.06
Economic development							
. Agriculture	14.37	17.24	18.24	19.87	22.73	24.53	40.17
. Other primary ind.	0.69	0.93	0.82	1.20	2.31	4.77	6.82
. Mining	0.11	0.16	0.18	0.15	0.20	0.10	0.12
. Manufacturing	34.62	49.24	25.38	51.83	63.10	58.97	61.40
. Construction	0.18	0.25	0.15	0.18	0.14	0.20	0.47
. Energy	5.20	6.81	9.16	10.97	13.49	12.27	11.95
. Transport	0.46	0.99	1.82	1.97	1.81	1.45	0.64
. Communications	0.5	0.9	1.15	1.58	1.84	1.99	4.55
. Economic serv. n.e.i.	0.10	0.10	0.09	0.10	0.04	0.35	0.38
Sub-total	56.3	76.7	57.0	87.8	105.7	104.6	126.5
Community welfare							
. Urban & reg. planning	0.10	0.04	0.02	0.08	0.03	..	0.01
. Environment	0.82	1.09	1.00	0.78	1.00	1.35	1.62
. Health	14.65	19.16	28.32	33.76	42.44	52.06	62.82
. Education	-	-	-	-	-	-	-
. Welfare	-	-	-	-	-	-	-
. Community services n.e.i.							
- Overseas development assistance	11.19	12.49	16.36	25.21	27.93	34.62	38.33
- Other services	0.15	0.23	0.22	0.18	0.15	0.17	0.66
Sub-total	26.91	33.01	45.92	60.00	71.54	88.20	103.43
Advancement of knowledge							
. Earth, ocean & atm.	1.37	3.19	3.77	3.91	3.11	4.10	4.53
. General advancement of knowledge	65.1	74.0	80.8	95.4	105.9	117.8	131.8
Sub-total	66.5	77.2	84.5	99.3	109.0	121.9	136.3
Total	150.0	187.2	188.2	248.2	287.2	315.9	367.3

NOTE: Expenditures from other sources (A.1) are not included in this table; ie, only direct Commonwealth funding is included.

able 21: Intramural Commonwealth Government expenditure on R&D in the social sciences and humanities by socio-economic objective

bjective Category		1979-80	1980-81	($m) 1981-82	1982-83	1983-84	1984-85	Projected 85-86
ational security								
Defence		-	-	-	-	-	-	-
conomic development								
Agriculture	(a)	-	-	-	-	-	0.16	0.01
	(b)	0.84	0.86	1.06	1.31	1.43	1.54	1.46
Other primary industries		-	-	-	-	-	-	-
Mining		-	-	-	-	-	-	-
Manufacturing	(a)	0.01	-	-	-	-	-	-
	(b)	0.02	-	-	-	-	-	-
Construction	(a)	..	-	-	-	-	..	..
	(b)	0.13	0.15	-	-	-	0.05	0.08
Energy	(a)	-	-	..	-	..	0.03	0.01
	(b)	-	0.04	0.04	0.13	0.07	0.36	0.27
Transport	(a)	..	0.02	0.01	-	0.01	0.01	0.01
	(b)	0.43	0.24	0.38	0.40	0.56	0.60	0.40
Communications	(a)	0.06	0.08	0.10	0.11	0.10	-	-
	(b)	0.74	0.85	0.99	0.98	1.14	0.07	0.02
Economic services n.e.i.	(a)	1.45	1.27	0.16	0.11	0.15	0.29	0.09
	(b)	6.19	6.91	5.72	4.99	4.90	6.94	8.31
ub-total	(a)	1.51	1.38	0.27	0.22	0.26	0.50	0.12
	(b)	8.35	9.05	8.18	7.81	8.10	9.56	10.53
ommunity welfare								
Urban & regional planning	(a)	..	-	..	0.40	..	0.01	..
	(b)	0.06	0.07	0.11	0.50	0.32	0.25	0.23
Environment		-	-	-	-	-	-	-
Health	(a)	..	-	-	-	-	-	-
	(b)	0.15	0.13	-	-	-	-	-
Education	(a)	-	..	0.01	-	0.01	0.05	0.01
	(b)	0.95	1.06	1.05	0.68	1.01	1.59	1.61
Welfare	(a)	0.01	0.03	0.01	-	..	0.09	0.04
	(b)	1.02	1.56	1.11	2.17	0.93	1.64	2.30
Community services n.e.i.	(a)	0.01	0.08	0.03	0.14	0.23	0.34	0.25
	(b)	2.00	2.65	2.88	3.31	4.71	5.71	5.89
ub-total	(a)	0.02	0.12	0.05	0.54	0.24	0.49	0.30
	(b)	4.18	5.37	5.15	6.67	6.97	9.19	10.02

				($m)				Projected
Objective Category		1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	85-86
Advancement of knowledge								
. Earth, ocean and atmosphere		-	-	-	-	-	-	-
. General advancement of knowledge	(a)	-	-	0.01	-	..	0.01	..
	(b)	-	-	0.17	0.03	0.11	0.06	0.05
Sub-Total	(a)	-	-	0.01	-	..	0.01	..
	(b)	-	-	0.17	0.03	0.11	0.06	0.05
Total	(a)	1.53	1.50	0.32	0.76	0.50	0.99	0.42
	(b)	12.53	14.38	13.50	14.50	15.18	18.80	20.60

able 22: Extramural Commonwealth Government expenditure on R&D in the social sciences and humanities by socio-economic objective

bjective Category	1979-80	1980-81	($m) 1981-82	1982-83	1983-84	1984-85	Projected 85-86
ational security							
Defence	-	-	-	-	-	-	-
conomic development							
Agriculture	0.59	0.60	0.30	0.01	0.01	0.09	0.07
Other primary industries	-	-	-	-	-	-	-
Mining	-	-	-	-	-	-	-
Manufacturing	0.01	-	-	-	-	-	-
Construction	-	-	-	-	-	-	-
Energy	0.07	0.07	0.35	0.82	0.49	0.25	-
Transport	3.00	2.30	0.31	0.40	0.43	0.67	0.82
Communications	0.03	0.01	0.18	-	-	-	-
Economic services n.e.i.	0.12	0.49	0.63	0.87	1.06	1.46	1.58
ub-total	3.81	3.47	1.77	2.10	2.00	2.47	2.46
ommunity welfare							
Urban & regional planning	-	-	-	-	-	-	-
Environment	-	0.01	0.01	-	0.04	0.01	0.01
Health	0.02	0.23	0.19	0.01	0.03	0.01	1.05
Education	2.16	2.88	2.79	1.88	1.96	2.27	2.24
Welfare	0.65	0.93	0.92	1.15	1.03	0.88	1.25
Community services n.e.i.							
- Overseas development assistance	1.28	2.78	3.46	4.49	4.54	5.35	4.57
- Other services	0.23	0.06	0.47	0.48	0.33	0.53	0.50
ub-total	4.34	6.88	7.84	8.00	7.93	9.05	9.62
dvancement of knowledge							
Earth, ocean & atm.	0.02	0.03	0.01	-	-	-	-
General advancement of knowledge	25.86	27.56	33.28	36.34	41.75	45.01	49.40
ub-Total	25.9	27.6	33.3	36.3	41.8	45.0	49.4
otal	34.0	37.9	42.9	46.4	51.7	56.5	61.5

B.2 Commonwealth Contracts and Grants in Support of S&T

In addition to the normal difficulties for respondents associated with R&D/S&T surveys, there are particular problems associated with collecting good quality information on contracting. For example, there is sometimes confusion between intramural "other current" expenditure and extramural contracting. Some respondents are also unclear on the classification of the organisations to which contracts are let and, occasionally, contracts are classed as grants and vice versa. For all these reasons, data presented in successive Science and Technology Statements have been subject to progressive revision and refinement.

The data presented in Tables 23 to 26, which represent the best estimates available at present, should therefore be utilised with some caution. As in other parts of the Statement care has been exercised to ensure consistent reporting from year to year within organisations.

able 23: Commonwealth contracting in the natural sciences and engineering (NSE)

($ million)		R&D					S&T (including R&D)			
					Projected				Projected	
		81-82	82-83	83-84	84-85	85-86	82-83	83-84	84-85	85-86
Arts, Heritage and Environment	CW	0.04	0.06	0.08	0.23	0.42	0.25	0.57	0.74	1.31
	PE	0.05	0.02	0.04	0.14	0.13	0.52	0.58	0.72	0.74
	HE	0.36	0.23	0.28	0.31	0.29	0.31	0.42	0.43	0.60
	OR	0.05	0.07	0.05	0.04	0.05	0.28	0.32	0.30	0.31
Aviation	CW	0.06	0.03	0.08	0.11	0.09	15.83	15.58	15.84	16.08
	PE	0.01	-	0.04	-	-	-	0.04	0.01	-
	HE	0.27	0.26	0.29	0.27	0.27	0.27	0.34	0.34	0.35
	OR	-	-	-	0.01	..	-	-	0.01	..
Communications	CW	0.04	0.04	0.04	0.03	0.25	0.08	0.08	0.07	0.29
	PE	0.72	1.18	1.11	0.92	2.12	6.51	9.58	13.09	15.29
	HE	0.17	0.22	0.40	0.65	1.81	0.22	0.40	0.73	1.85
Defence	CW	0.43	0.55	0.57	0.54	0.43	4.80	0.57	0.54	0.43
	PE	-	-	-	-	-	14.10	21.43	2.86	2.56
	HE	0.31	0.50	0.34	0.58	0.63	0.50	0.34	0.58	0.63
Foreign Affairs	CW	2.34	2.40	3.73	5.00	6.04	22.04	15.33	14.70	14.09
	PE	0.62	0.49	0.02	0.50	0.76	26.78	47.73	46.78	47.58
	HE	2.77	4.38	6.22	7.32	8.27	5.43	9.50	9.89	10.69
	OR	0.18	0.78	1.70	3.22	4.85	5.45	6.49	7.53	11.48
Health	PE	-	-	-	-	-	0.01	0.05	0.09	0.04
	HE	0.22	0.22	0.14	-	-	0.22	0.27	-	-
Housing and Construction	PE	0.03	0.04	0.08	0.04	0.16	1.84	0.08	0.04	0.16
	HE	0.09	0.10	0.01	0.05	0.16	0.10	0.01	0.05	0.16
	OR	0.02	0.02	0.03	0.07	0.11	0.02	0.03	0.07	0.11
Industry, Technology and Commerce	CW	2.07	2.19	2.53	-	-	2.19	2.56	0.05	0.05
	PE	0.01	-	-	-	-	4.22	7.64	9.26	9.81
	HE	0.01	-	-	-	-	1.99	3.85	3.65	3.62
	OR	-	-	-	-	-	-	-	0.14	0.16
Local Govt & Administrative Services	CW	-	0.07	-	-	-	0.07	0.01	-	-
	PE	0.01	..	0.03	..	..	1.46	1.91	1.80	1.99
	HE	-	..	-	..	..	..	-	..	..
	OR	0.01	-	-	-	-	-	-	-	-
Primary Industry	CW	0.18	0.28	0.31	2.44	2.51	0.28	0.33	3.35	3.48
	OR	-	0.04	0.05	0.79	0.81	0.96	2.62	18.39	19.70

($ million)		R&D					S&T (including R&D)			
					Projected				Projected	
		81-82	82-83	83-84	84-85	85-86	82-83	83-84	84-85	85-86
Prime Minister and Cabinet	CW	-	-	-	0.02	0.02	-	-	0.02	0.02
	PE	-	-	-	-	-	0.01	-	-	..
	HE	-	-	-	0.04	0.04	..	..	0.04	0.04
Resources and Energy	CW	0.02	0.09	0.05	-	0.10	0.24	0.39	0.81	1.17
	PE	0.11	0.28	0.04	-	-	1.97	1.86	2.28	2.73
	HE	0.35	0.42	0.14	-	0.05	0.56	0.14	-	0.05
	OR	0.32	0.20	0.08	0.04	0.10	0.22	0.92	0.65	0.96
Science	CW	0.34	0.37	0.50	0.44	0.50	0.44	0.50	2.48	3.19
	PE	0.16	0.28	0.23	0.07	0.03	0.62	0.34	0.20	0.17
	HE	0.09	0.02	0.04	0.25	0.26	0.07	0.04	0.27	0.28
	OR	0.06	0.07	0.18	-	-	0.07	0.20	0.03	0.02
Special Ministry of State	CW	..	-	-	-	-	-	-	-	-
	HE	0.17	0.11	0.11	0.12	0.08	0.11	0.11	0.12	0.08
	OR	0.23	-	0.02	0.03	0.03	-	0.02	0.03	0.03
Territories	CW	0.01	-	0.02	0.02	0.02	0.04	0.07	0.05	0.09
	PE	..	0.02	-	-	-	0.04	0.17	0.14	0.13
	HE	-	-	-	-	-	0.01	-	-	0.03
	OR	-	-	-	-	-	-	-	0.01	-
Transport	CW	-	-	-	-	-	0.01	-	-	-
	PE	0.01	..	-	-	-	0.10	-	-	-
	HE	-	-	-	-	-	0.04	..	..	-
	OR	-	-	-	-	-	0.06	-	-	-
Treasury	CW	-	-	-	-	0.02	-	-	-	0.02
	PE	-	-	-	0.10	0.10	-	-	0.10	0.10
Total Contracts to Other Commonwealth Agencies		5.53	6.08	7.92	8.84	10.40	46.27	35.98	38.66	40.21
Total Contracts to Private Enterprise		1.71	2.31	1.57	1.76	3.29	58.15	91.41	77.37	81.30
Total Contracts to HE		4.80	6.45	7.95	9.60	11.86	9.81	15.43	16.11	18.39
Total Contracts to Others		0.65	1.19	2.10	4.20	5.95	7.05	10.59	27.16	32.77
Total (Direct Commonwealth Funding all NSE contracts)		12.69	16.03	19.54	24.40	31.50	121.80	153.71	159.30	172.67

CW	Contracts to other Commonwealth agencies	PE	Contracts to private bus. enterprise
HE	Contracts to institutions of higher education	OR	Contracts to other bodies.

able 24: Commonwealth contracting in the social sciences and humanities (SSH)

($ million)		R&D					S&T (including R&D)			
		81-82	82-83	83-84	Projected 84-85	Projected 85-86	82-83	83-84	Projected 84-85	Projected 85-86
Aboriginal Affairs	PE	-	-	0.01	0.05	-	-	0.01	0.05	-
	HE	-	-	0.09	0.10	0.05	-	0.09	0.10	0.05
	OR	-	-	-	-	0.03	-	-	-	0.03
Arts, Heritage and Environment	CW	-	-	-	-	-	..	..	0.02	0.02
	PE	0.01	0.01	-	-	-	0.01	0.02	0.04	0.04
	HE	0.03	0.01	-	-	-	0.03	0.03	0.03	0.20
Attorney-General's	PE	0.07	0.04	0.05	0.07	-	0.04	0.05	0.07	-
	HE	0.06	0.17	0.04	0.07	0.06	0.17	0.05	0.07	0.06
	OR	0.14	0.06	0.01	0.08	0.14	0.06	0.01	0.08	0.14
Aviation	CW	0.01	-	-	-	-	-	-	-	-
	PE	..	-	-	-	-	0.28	0.10	0.08	0.02
Communications	PE	0.17	-	-	-	-	0.03	0.04	0.04	0.04
	HE	0.01	-	-	-	-	-	-	-	-
Community Services	PE	0.05	0.12	-	-	-	0.12	..	-	0.03
	HE	0.11	0.29	-	-	-	0.29	0.40	0.25	0.23
	OR	0.08	0.05	0.08	0.04	0.10	0.07	0.21	0.04	0.35
Education	CW	0.02	-	0.01	-	-	-	0.17	0.22	0.24
	PE	..	-	0.13	0.16	0.18	0.50	0.22	0.29	0.42
	HE	0.34	0.28	0.48	0.59	0.60	0.61	0.62	0.86	1.14
	OR	0.15	0.27	0.25	0.27	0.25	0.42	0.63	0.64	0.62
Employment and Industrial Relations	PE	0.02	-	-	-	-	0.01	0.04	0.40	0.98
	HE	0.03	0.01	-	0.36	0.60	0.11	0.02	0.51	0.62
	OR	-	-	0.13	0.11	0.10	-	0.13	0.11	0.10
Foreign Affairs	CW	0.03	0.07	0.46	0.63	0.90	2.00	3.19	3.28	3.13
	PE	0.04	0.01	0.03	-	0.08	1.20	1.86	3.35	1.83
	HE	-	0.01	..	0.01	-	0.10	0.41	0.72	0.74
	OR	-	-	-	-	-	0.02	0.18	0.16	0.72
Health	HE	-	-	-	-	-	0.01	-	-	-
Immigration and Ethnic Affairs	CW	-	0.02	-	-	-	0.10	0.20	0.06	0.02
	PE	0.12	0.14	0.10	0.14	0.15	0.33	0.45	0.65	0.44
	HE	0.11	0.07	0.04	0.04	0.05	0.18	0.15	0.18	0.09
	OR	0.03	0.03	-	0.05	0.03	0.03	..	0.08	0.07

($ million)		R&D					S&T (including R&D)			
					Projected				Projected	
		81-82	82-83	83-84	84-85	85-86	82-83	83-84	84-85	85-86
Industry Technology and Commerce	PE	0.08	0.09	-	-	-	0.09	..	-	-
	HE	-	0.01	-	-	-	0.01	-	0.03	0.03
	OR	0.02	..	-	-	-		0.02	0.01	0.01
Prime Minister and Cabinet	CW	-	-	-	0.02	0.04	-	0.01	0.02	0.05
	PE	0.02	0.01	0.03	-	-	0.02	0.08	0.03	-
	HE	0.01		0.04	0.08	0.15	..	0.04	0.08	0.15
Resources and Energy	CW	-	-	-	-	-	0.07	-	-	-
	PE	-	-	-	-	-	0.02	-	-	-
	HE	0.01	-	-	-	-	0.05	-	-	-
	OR	-	-	-	-	-	0.01	-	-	-
Territories and Local Government	PE	-	-	-	-	-	0.05	0.06	0.08	0.23
Transport	CW	-	-	..	0.04	0.07	-	..	0.08	0.15
	PE	0.10	0.13	0.14	0.06	0.12	0.19	0.22	0.56	0.62
	HE	0.02	0.03	0.07	0.02	0.04	0.05	0.09	0.12	0.12
	OR	0.03	0.04	0.02	-	0.04	0.04	0.03	0.16	0.06
Total Contracts to Other Commonwealth Agencies		0.06	0.08	0.45	0.69	1.01	2.18	3.57	3.68	3.59
Total Contracts to Private Enterprise		0.67	0.55	0.49	0.48	0.52	2.90	3.16	5.64	4.65
Total Contracts to HE		0.72	0.89	0.76	1.27	1.54	1.63	1.88	2.94	3.43
Total Contracts to Others		0.46	0.45	0.49	0.54	0.68	0.64	1.21	1.27	2.10
Total (Direct Commonwealth funding, all SSH contracts)		1.91	1.97	2.20	2.98	3.75	7.35	9.82	13.53	13.77

CW	Contracts to other Commonwealth agencies	PE	Contracts to private business enterprise
HE	Contracts to institutions of higher education	OR	Contracts to other bodies

Table 25: Commonwealth grants in the natural sciences and engineering (NSE)

($ million)		R&D					S&T (including R&D)			
					Projected				Projected	
		81-82	82-83	83-84	84-85	85-86	82-83	83-84	84-85	85-86
Aboriginal Affairs	PE	..	-	-	-	-	-	-	-	-
	OR	-	-	-	-	-	0.13	0.08	0.12	0.16
Arts, Heritage and Environment	CW	0.06	0.03	0.09	0.08	0.08	0.07	0.16	0.14	0.14
	PE	-	-	0.07	0.03	0.02	0.05	0.12	0.08	0.07
	HE	0.24	0.21	0.19	0.13	0.19	0.28	0.30	0.40	0.41
	OR	0.19	0.16	0.19	0.35	0.38	0.47	1.11	1.44	1.57
Communications	HE	0.04	0.09	0.09	0.09	0.07	0.09	0.09	0.09	0.07
	OR	0.19	0.05	0.21	0.29	0.30	0.05	0.21	0.29	0.30
Education	HE	60.99	72.79	78.80	86.90	95.60	72.79	78.80	86.90	95.60
	OR	5.1	6.6	8.6	9.0	10.1	7.0	9.1	9.4	10.6
Employment and Industrial Relations	CW	-	-	-	0.07	1.03	-	-	0.24	1.20
	PE	..	-	-	0.05	0.72	-	-	0.05	0.72
	HE	-	-	-	0.05	0.76	-	-	0.05	0.76
	OR	-	-	-	-	-	0.16	0.16	-	-
Foreign Affairs	CW	-	-	-	-	-	1.13	0.01	-	-
	PE	-	-	-	-		..	..	..	..
	HE	2.07	3.14	1.49	2.22	2.98	15.46	20.75	29.77	32.57
	OR	8.40	14.05	14.80	16.39	15.97	36.16	40.03	44.69	44.93
Health	CW	1.38	1.59	0.23	0.27	0.31	1.59	0.23	0.27	0.31
	HE	13.35	15.43	23.42	27.67	31.96	16.34	24.09	27.93	32.02
	OR	13.38	16.51	18.64	23.75	28.06	16.88	19.24	23.92	29.23
Industry, Technology & Commerce	CW	-	-	0.44	1.14	1.47	-	0.44	1.14	1.47
	PE	22.96	49.21	59.62	56.67	58.08	53.36	65.04	62.63	99.00
	HE	-	-	0.15	0.46	0.61	-	0.15	0.46	0.61
	OR	-	-	-	0.16	0.59	-	-	0.16	0.59
Primary Industry	CW	6.80	7.97	10.03	7.07	14.98	9.56	11.78	7.16	15.10
	PE	0.25	0.85	1.15	0.88	1.73	1.32	1.56	0.90	1.77
	HE	4.03	4.52	4.82	5.14	8.76	4.87	5.22	5.14	8.76
	OR	5.43	5.32	5.66	9.76	14.66	8.09	6.91	11.20	16.59
Prime Minister and Cabinet	OR	0.03	0.03	0.02	..	..	0.06	0.06	..	..

		R&D					S&T (including R&D)			
					Projected				Projected	
		81-82	82-83	83-84	84-85	85-86	82-83	83-84	84-85	85-86
Resources and Energy	CW	2.73	1.72	1.67	1.99	1.83	2.24	2.18	2.27	2.03
	PE	3.31	4.56	6.82	5.52	5.38	5.20	7.66	6.54	7.41
	HE	2.72	3.37	3.39	3.45	3.40	4.05	4.07	3.93	3.87
	OR	1.56	2.25	2.26	1.92	1.98	12.45	10.61	11.04	11.23
Science	CW	0.23	0.23	0.18	0.26	0.29	0.24	0.23	0.37	0.35
	PE	-	-	0.01	0.53	1.01	-	0.01	0.56	1.11
	HE	14.68	16.20	18.40	22.78	26.62	16.29	18.43	22.82	26.71
	OR	1.90	1.92	2.19	2.01	2.22	3.55	3.49	3.61	3.75
Special Ministry of State	OR	-	-	..	..	..	0.08	0.12	0.05	0.10
Transport	OR	1.47	1.66	1.40	1.06	0.28	2.39	2.23	1.89	1.11
Treasury	HE	0.72	0.72	0.98	1.70	1.72	0.74	0.99	1.71	1.73
	OR	1.29	1.02	1.53	0.99	1.14	1.02	1.53	0.99	1.14
Total grants to other Commonwealth Agencies		11.19	11.53	12.64	10.87	19.97	14.83	15.02	11.58	20.59
Total grants to higher educ.		98.8	116.5	131.7	150.8	172.67	130.9	152.9	179.2	203.1
Total grants to private enterprise		26.53	54.62	67.66	63.68	66.93	59.93	74.39	70.75	110.07
Total grants to others		38.95	49.57	55.53	65.69	75.68	88.45	94.87	108.81	120.24
Total (Direct Commonwealth funding, all NSE grants)		175.5	232.2	267.5	291.0	335.3	294.1	337.2	370.3	454.0

PE	Grants to private enterprise or in support of industry
CW	Grants to other Commonwealth agencies
HE	Grants to institutions of higher education
OR	Grants to other bodies

able 26: Commonwealth grants in the social sciences and humanities (SSH)

($ million)		R&D					S&T (inclucing R&D)			
					Projected				Projected	
		81-82	82-83	83-84	84-85	85-86	82-83	83-84	84-85	85-86
boriginal Affairs	PE	0.02	0.02	-	-	-	0.02	-	-	-
	HE	0.07	0.04	0.17	0.32	0.30	0.04	0.17	0.32	0.30
	OR	0.53	0.47	0.17	0.07	0.05	0.73	0.75	0.84	0.78
rts, Heritage and Environment	HE	-	-	0.04	0.01	0.01	..	0.04	0.02	0.03
	OR	-	-	0.01	-	-	-	0.01	-	-
ttorney-General's	PE	-	-	-	0.01	0.01	-	-	0.01	0.01
	HE	0.03	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.05
	OR	0.04	0.05	0.03	0.04	0.04	0.05	0.03	0.21	0.29
ommunity Services	PE	-	-	0.07	-	0.25	-	0.07	-	0.25
	OR	-	-	-	-	-	0.25	0.45	0.03	0.03
ducation	PE	..	-	-	-	-	-	-	-	-
	HE	26.3	27.3	31.0	32.9	35.5	27.4	31.2	33.1	35.7
	OR	4.8	5.6	6.9	7.4	8.1	6.8	8.6	9.0	10.0
mployment nd Industrial Relations	PE	..	-	-	-	-	-	-	-	-
	HE	..	0.05	0.26	0.08	0.08	0.05	0.26	0.08	0.08
	OR	0.06	-	-	0.09	0.09	-	-	0.09	0.29
oreign Affairs	HE	1.47	2.29	1.68	1.81	1.89	14.35	12.11	16.83	14.88
	OR	2.09	2.48	2.75	3.52	2.47	16.59	14.07	12.56	10.66
ealth	HE	0.01	0.01	0.03	-	0.05	0.01	0.03	-	0.05
	OR	0.18	-	0.01	0.01	1.00	-	0.01	0.01	1.00
mmigration & Ethnic Affairs	PE	-	-	-	-	-	..	0.01	0.07	0.08
	HE	-	-	-	-	-	-	0.01	0.02	0.02
ndustry, Technology and Commerce	HE	-	0.08	0.09	0.10	0.10	0.08	0.09	0.10	0.10
ocal Govt & Admin Services	OR	-	-	-	-		0.04	0.04	0.04	0.04
rimary Industry	CW	0.16	-	-	-	0.01	-	-	-	0.01
	PE	-	-	-	-	0.01	-	0.01	-	0.01
	HE	0.06	-	0.01	0.09	0.03	-	0.08	0.15	0.11
	OR	0.08	0.01	-	-	0.02	0.01	-	0.05	0.06

($ million)		R&D					S&T (including R&D)			
					Projected				Projecte	
		81-82	82-83	83-84	84-85	85-86	82-83	83-84	84-85	85-
Prime Minister and Cabinet	OR	0.01	0.04	0.05	0.01	..	0.09	0.09	0.01	..
Resources and Energy	CW	0.16	0.10	-	0.01	-	0.10	-	0.01	-
	HE	0.15	0.64	0.42	0.19	-	0.64	0.42	0.19	-
	OR	0.04	0.08	0.08	0.06	-	0.47	0.10	0.08	-
Science	CW	-	-	0.01	-	-	-	0.01	-	-
	PE	-	-	0.01	-	-	-	0.01	-	-
	HE	3.76	4.08	4.43	5.32	6.36	4.08	4.43	5.33	6.3
	OR	0.10	0.17	0.15	0.10	0.11	0.34	0.35	0.28	0.3
Social Security	HE	0.55	0.59	0.68	0.68	0.68	0.59	0.68	0.68	0.6
Special Minister of State	OR	-	-	-	-	-	0.05	0.08	0.07	0.1
Transport	OR	0.16	0.19	0.20	0.55	0.55	0.19	0.20	0.71	0.7
Treasury	HE	0.16	0.18	0.21	0.34	0.23	0.18	0.21	0.34	0.2
	OR	-	..	-	-	-	0.01	..	-	-
Total grants to other Commonwealth agencies		0.32	0.10	0.01	0.01	0.01	0.10	0.01	0.01	0.0
Total grants to private enterprise		0.02	0.02	0.07	0.01	0.27	0.02	0.09	0.08	0.3
Total grants to higher educ.		32.6	35.3	39.0	41.9	45.3	47.5	49.7	57.2	58.6
Total grants to other bodies		8.06	9.03	10.36	11.82	12.47	25.59	24.75	24.01	24.2
Total (Direct Commonwealth funding, all SSH grants)		41.0	44.5	49.4	53.7	58.1	73.2	74.6	81.3	83.2

PE Grants to private enterprise or in support of industry

HE Grants to institutions of higher education

CW Grants to other Commonwealth agencies

OR Grants to other bodies

REVIEW OF BILATERAL SCIENCE AND TECHNOLOGY COOPERATION AGREEMENTS

The Department of Science operates bilateral science and technology agreements ith the USA (1968), USSR (1975), India (1975), the Federal Republic of Germany FRG) (1976), Japan (1980), China (1980) and Mexico (1981). Activities under the agreements have included short term research visits, seminars, workshops, and exchanges of olicy delegations. Normal activity under the Agreement with the USSR is being ecommenced in 1985-86 after an exchange of delegations in 1984-85.

Applications under each of the agreements are sought from the research ommunity. Additionally proposals in specific fields are developed in collaboration with he partner country following identification of priority areas. Program selection is on he basis of scientific or technological merit together with the likely contribution of roposals to the economic development of Australia and the other country concerned. enerally the agreements are not intended as a primary source of research funds. It is xpected that the collaborating institutions provide the bulk of the necessary funding hile the agreements provide support for airfares, living allowances and the running of eminars and workshops.

The following table shows funds outlayed under the Agreements for the 1979-80 to 985-86 fiscal years disaggregated by subject area.

able 27: Summary of Australian support for bilateral science and technology cooperation agreements

	1979-80 $	1980-81 $	1981-82 $	1982-83 $	1983-84 $	1984-85 $	Projected 85-86 $
S/Australia Agreement for cientific and Technical ooperation							
hysical and Chemical Sciences	15 254	16 194	22 793	19 377	28 685	20 239	42 245
ngineering & Applied Science	9 794	11 269	5 200	7 255	20 189	25 602	36 140
iological and Agricultural Sciences	41 276	43 200	28 400	21 568	27 716	93 896	49 175
arth Sciences	14 506	-	9 474	28 401	12 500	35 264	25 075
ocial Sciences	9 428	4 331	11 050	2 875	26 612	5 602	-
ther	-	-	-	-	-	-	265
ub-total	90 258	74 994	76 917	79 476	105 702	180 603	153 000
ndia/Australia Science and echnology Agreement							
hysical and Chemical Sciences	-	-	10 856	1 672	2 328	-	3 600
ngineering & Applied Science	1 584	2 105	1 200	-	1 600	-	-
iological and Agricultural Sciences	25 239	12 775	2 790	800	2 800	-	9 500
arth Sciences	3 395	18 082	23 160	10 422	7 560	-	5 850
ocial Sciences	-	-	-	-	-	-	
ther	-	-	-	-	-	-	17 050
ub-total	30 218	32 962	38 006	12 894	14 288	-	36 000

	1979-80 $	1980-81 $	1981-82 $	1982-83 $	1983-84 $	1984-85 $	Projecte 85-86 $
FRG/Australia Science and Technology Agreement							
Physical and Chemical Sciences	9 526	4 324	2 700	3 930	-	3 875	4500
Engineering & Applied Science	-	-	1 300	2 994	-	18 365	6 000
Biological and Agricultural Sciences	4 278	4 775	7 975	21 999	16 195	-	33 000
Earth Sciences	11 428	15 900	9 000	8 070	-	5 200	6 500
Social Sciences	-	-	-	-	-	17 264	-
Sub-total	25 262	24 999	20 975	36 993	16 195	44 704	50 000
Japan/Australia Science and Technology Agreement							
Physical and Chemical Sciences	-	-	-	13 400	-	2 000	1 630
Engineering & Applied Science	-	28 140	7 483	50 009	33 500	40 543	10 904
Biological and Agricultural Sciences	-	27 400	21 700	67 002	38 757	46 479	7 080
Earth Sciences	-	-	-	2 300	23 800	36 582	15 000
Social Sciences	-	-	-	-	-	-	-
Other	-	-	6 035	1 207	28 736	35 000	35 386
Sub-total	-	55 540	35 318	133 918	124 793	160 604	70 000
Mexico/Australia Science and Technology Agreement							
Physical and Chemical Sciences	-	-	-	3 000	-	-	-
Engineering & Applied Science	-	-	2 854	3 000	-	1 660	25 380
Biological and Agricultural Sciences	-	-	-	25 436	7 269	13 800	7 620
Earth Sciences	-	-	-	-	-	11 180	-
Social Sciences	-	-	-	-	-	-	-
Other (Senior Scientific Delegations)	-	-	22 030	711	12 617	-	-
Sub-total	-	-	24 884	32 147	19 886	26 640	33 000

	1979-80 $	1980-81 $	1981-82 $	1982-83 $	1983-84 $	1984-85 $	Projected 85-86 $
China/Australia Science and Technology Agreement							
Physical and Chemical Sciences	-	-	-	-	-	-	-
Engineering & Applied Science	-	-	-	-	-	3 414	16 836
Biological and Agricultural Sciences	-	-	-	-	960	-	13 744
Earth Sciences	-	-	-	2 820	-	-	9 420
Social Sciences	-	-	-	-	-	-	3 000
Other (Senior Scientific Delegations)	-	-	19 000	752	34 165	46 275	45 000
Sub-total	-	-	19 000	3 572	35 185	49 689	88 000
USSR/Australia Science and Technology Agreement							
Physical and Chemical Sciences	-	-	-	-	-	-	25 000
Earth Sciences	-	-	-	-	-	-	25 000
Other	-	-	-	-	-	21 762	50 000
Sub-total	-	-	-	-	-	21 762	50 000
Bilateral exchanges outside Agreements							
UK							
Royal Society Exchange	-	-	-	-	-	50 000	50 000
Non Agreement Countries							
Biology	-	-	-	-	-	-	38 000
Not Assigned to a Specific Country	-	-	-	-	-	24 998	18 730
GRAND TOTAL	145 758	188 225	215 000	299 000	318 804	559 000	586 730

TECHNICAL NOTES

D.1 Background

The concepts and methodology employed in this Statement are based on or developed from international standard practices developed for science and technology statistics. The first Statement in this series, Science Statement 1978-79 was modelled on similar publications issued regularly by several other countries, including Canada, the Netherlands, and the United States. Appendix 6 of Science and Technology Statement 1981-82 outlines the development of the Statement prior to 1982-83. The remainder of the present Appendix describes the current concepts and methodology. Tables for the statement are prepared by the Indicators and Resource Analysis Section (IRAS) of the Department of Science. Further information is available from IRAS.

D.2 Definitions and concepts

- Research and development (R&D)

The definition adopted by the Organization for Economic Co-operation and Development (OECD) (1) was used in the information collection:

> Research and experimental development (R&D) comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society and the use of this stock of knowledge to devise new applications.

To clarify this definition the information collection guidelines included the following:

> Any activity classified as R&D should contain an appreciable amount of novelty, it should have investigation as a primary objective, and should have a potential to produce results that are sufficiently general for mankind's stock of knowledge (theoretical and/or practical) to be recognisably increased. The concept of novelty is not associated with the actual creation of something which, although new, is made by artistry or by application of techniques that have already been established for that class of object. For example, devising and validating a new econometric model is R&D, whereas the econometric modelling of economic systems for policy purposes, using established techniques, is not R&D.
>
> R&D ceases when work is no longer experimental. Once its primary objective is no longer investigation, an activity can no longer be considered as R&D even though it could be regarded as an important part of the total innovative process.
>
> Note that R&D extends to substantial modifications to existing processes, systems, services and products.

The above definition and guidelines are also used in the Project SCORE R&D survey (2).

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(1) The Measurement of Scientific and Technical Activities: Proposed Standard Practice for Surveys of Research and Experimental Development, "Frascati Manual" 1980 OECD Paris June 1980.

(2) Research and Experimental Development, All Sector Summary, Australia, 1981-82, Australian Bureau of Statistics Cat. No. 8112.0, February 1984, Appendix A, pp1-2.

Science and technology (S&T)

The activities to be included, in addition to R&D, as science and technology were resented in the guidelines in the form of a descriptive list as follows:

.3 Interpretation of S&T Activities (other than R&D)

- Demonstration of both technical and commercial viability: Demonstration projects and production and operation of pilot plant or equipment aimed at demonstrating both the technical and commercial viability of specific innovatory products or processes.

- Design for innovative production or service: Design engineering and 'tooling-up', often following either an experimental development or a successful demonstration phase, and aimed at establishing innovatory products or processes on a routine production basis or at providing an innovatory service. Includes products, processes or services new to Australia, regardless of whether or not these are well developed elsewhere.

- Technology transfer, extension services, other active diffusion of scientific and technological skills and know-how: Regular routine work on advising clients, including other sections of an organisation and independent users, to promote use of scientific, technological and management information. This activity includes extension and advisory services organised for farmers and for industry. It involves the transfer of skills, capabilities and 'know-how' to clients.

- Advanced scientific or engineering services: Consulting services to provide clients, including other sections of an organisation and independent users, with technologically advanced designs, products or processes, or with reports based on advanced scientific or technological analysis. Engineering feasibility studies are included in this category, except where they involve econometric techniques and/or operations research. The provision of products relying on advanced technology (e.g. isotopes) is also included.

- Policy-related studies using advanced techniques: Policy-related studies using operations research and/or econometric techniques. This category includes feasibility studies involving such techniques.

- Testing, standardisation, metrology and quality control: Regular routine work on the analysis, checking and testing, by recognised methods, of materials, products, devices and processes, together with the setting up and maintenance of standards, including standards of measurement.

- Patenting and licensing: Activities relating to patents and licenses: systematic work of a scientific, legal and administrative nature on patents and licences.

- Data collection in the natural sciences: Geodetic, topographical, Geological and Hydrological surveying (including prospecting and related activities designed to locate and identify oil and mineral resources); routine astronomical, meteorological and seismological observations; surveying of soils and of plants, fish and wildlife resources; routine soil, atmosphere and water monitoring and the routine monitoring of radioactivity levels.

- Data collection in the social sciences: The gathering of information on human, social, economic and cultural phenomena, usually for the purpose of compiling routine statistics, e.g. population censuses, production, distribution and consumption statistics, market studies, social and cultural statistics etc.

- Scientific and technological information and documentation: S&T services provided by libraries, archives, information and documentation centres, reference departments, scientific congress centres, data banks and information-processing departments. Such services include S&T bibliographic searches, provision of S&T documents, provision of access to organised S&T information systems and the management of any associated data bases. Support for S&T conferences is included in this category. Systematic work on the translation and editing of S&T books and periodicals (except for textbooks used in school and university courses) is also included.

- Services associated with scientific and technological collections: S&T services provided by museums of science and/or technology, botanical and zoological gardens and other S&T collections.

- Scientific and technical education and training: Specialised non-university higher education and training, higher education and training leading to a university degree (except research training of (post) graduate students which is regarded as part of R&D), and organised lifelong training for scientists and engineers.

- Administration of S&T activities, policy, planning and other studies of S&T, n.e.i.: Administrative, policy, planning and related activities concerned with S&T which are not an integral part of one of the other defined S&T activities. The Australian Science and Technology Council (ASTEC) and the Policy Division of the Department of Science are examples falling in this category.

D.4 The nature of S&T data included in Science and Technology Statements from 1982-83 onwards

In Statements prior to 1982-83, S&T (other than R&D) was collected for all or most agencies on a different basis from R&D (3). In collecting data for the 1982-83 Statement this difference was removed. S&T data shown in this Statement should therefore in principle embody estimates of the S&T components of programs, rather than simply include or exclude total programs on the basis of whether there is or is not a preponderance of S&T activity.

While this change should make comparisons between Ministries more meaningful, caution must still be exercised in view of the lack of a statistically satisfactory definition of S&T and the corresponding wide discretion as to whether particular activities should be included. Reporting of these activities (other than R&D) for the present Statement remains uneven, particularly in the social sciences, where agencies often see their activities as having little or no relevance to a Statement on science and technology.

D.5 Broad field of science

Some users of the first two Statements, including ASTEC, highlighted a need to distinguish between activities in the natural sciences and engineering (NSE) and those in the social sciences and humanities (SSH). This is common practice in R&D statistics, where the data are collected from R&D performers, but is more difficult when data are collected from R&D funding agencies. Nevertheless, it proved possible to make reasonable estimates of the expenditures on NSE and SSH for nearly all agencies and programs. The guidelines used were as follows:

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(3) Research and Experimental Development, All Sector Summary, Australia, 1981-82, Australian Bureau of Statistics Cat. No. 8112.0, February 1984, Appendix A, p5.

(a) for R&D

R&D reported should be classified as either natural sciences and engineering (NSE) or social sciences and humanities (SSH) according to the field of science in which the R&D is performed, as follows:

Natural Sciences and Engineering (NSE) includes:

- Agricultural sciences and forestry, biological sciences, chemical sciences, earth sciences, engineering and applied sciences, mathematical sciences, medical sciences, and physical sciences.

Social Sciences and Humanities (SSH) includes:

- Accounting; demography; economics; geography (human, economic and social); information science; management; organisation and methods; miscellaneous business sciences and interdisciplinary, methodological and historical activities relating to subjects in this group. (Note that physical geography is classified with the earth sciences).
- Anthropology (social and culture) and ethnology; education and training; law; linguistics; political sciences; psychology; sociology; miscellaneous social sciences and interdisciplinary methodological and historical activities relating to subjects of this group. (Note that technical education, physical anthropology and psycho-physiology should normally be classified with the natural sciences and engineering.)
- Arts (history of the arts and art criticism, but excluding artistic activity itself); languages (ancient and modern languages and literature); philosophy (including the history of science and technology); prehistory and history, together with auxiliary historical disciplines such as archaeology, numismatics, palaeology, etc.; music; religion; other fields and subjects pertaining to the humanities and interdisciplinary, methodological, historical and other activities relating to the subjects in this group.

(b) for S&T (other than R&D)

Each of these S&T activities (other than R&D) may also be further classified, according to the purpose of the activity, as NSE-supporting and SSH-supporting. For activities concerned with the promotion of innovation or knowledge, such classification is determined by the field of the innovation or knowledge. For service activities it depends on the field of the major professional group relying on the service.

In many cases the NSE and SSH activities falling within a given S&T category are reasonably clear by analogy. To help clarify cases which are less clear the following examples were given:

- "Trialing" of a new educational curriculum is an example of SSH in the category "demonstration of both technical and commercial viability";
- A study using operations research and/or econometric techniques specifically related to the siting of a chemical plant is an example of NSE in the category "policy - related studies using advanced techniques";
- Services for anthropological and archeological collections are normally to be classified as SSH.

The division of S&T activities (other than R&D) into NSE-supporting and SSH-supporting categories is, as far as the Department is aware, an innovation in international practice. It is considered to be a useful distinction for policy purposes and in practice there was little difficulty for respondents in this aspect of the survey.

D.6 Expenditure definitions and guidelines

Definitions and guidelines used in the collection of financial data for this Statement are in harmony with those used in the Project SCORE R&D survey. Some key items are presented in this section.

- Intramural expenditure is expenditure for R&D or other S&T activities undertaken by the respondent organisation. Intramural expenditure is separated into the two categories, capital and current:

  Capital expenditure includes expenditure for:

  - Land, buildings and other structures (including major alterations but excluding repairs and maintenance, which are reported as "Other current expenditure"); includes relevant capital expenditures by the Departments of Housing and Construction and Administrative Services on behalf of each agency;

  - Vehicles, plant, machinery and equipment (expenditure incurred in the financial year on the acquisition (less disposal) of fixed tangible assets, either new or second-hand, with an expected life greater than one year. A proportion of expenditure on assets used partly for R&D should be included, but no such allowance should be included for other S&T).

  Current expenditure includes expenditure for:

  - Wages, salaries and other labour costs (these refer to gross earnings before taxation and other deductions. Overtime earnings, shift allowances, penalty rates, bonuses and commission payments to employees, holiday pay, payments to employees absent on long service leave, sick pay and similar payments, and employer contributions to superannuation and pension schemes are included. The employer contributions to superannuation and pension schemes where the contributions are paid by another organisation are excluded. (See p.5.)

  - Other current expenditure (includes expenditure on items such as travel expenses, materials, fuels, rent and leasing, repairs and maintenance, data processing, reference materials and special services in support of the R&D, e.g. payments to outside organisations for use of specialised testing facilities); includes relevant expenditure by the Department of Housing and Construction and Administrative Services on behalf of each agency.

- Extramural expenditure is expenditure for R&D or other S&T activities funded by the respondent organisation but undertaken (i.e. performed) by other organisations. Extramural expenditure was classified by type of payment into the two categories, "contracts and commissions" and "grants and donations":

  Contracts and commissions refer to funds disbursed specifically under contract or commission arrangements to other organisations to perform specified tasks. Totals for "contracts and commissions" to other Commonwealth agencies, private enterprise, and tertiary education institutions were separately reported.

Grants and donations refer to funds disbursed without contractual obligation on the part of the receiving organisation to perform specified tasks on behalf of the funding organisation (other than provision of a report describing the work performed). Totals for "grants and donations" to private enterprise and tertiary education institutions were separately reported.

For both intramural and extramural expenditure, respondents were asked to report the sources of funds to enable expenditures to be allocated to the "Commonwealth Budget sector", the "Commonwealth Non-budget sector", and "Other sources of expenditure". The reporting categories were as follows:

Own funds refers to funds available for use by the respondent Department or Authority, and may be received:

- via the Budget sector (consisting of all transactions relating to the Public Account i.e. the Consolidated Revenue Fund, Trust Fund and Loan Fund, as reported in the Budget Statements (4). All transactions of departments are recorded in the Public Account and are accordingly part of the Budget sector); and

- via the Non-Budget sector (consisting of all transactions of authorities which do not pass through the Public Account).

Other sources relate to funds other than "Own funds" which are only available for the specified activity, and include, for example, any levy component from Research Trust funds, and funding provided by other Commonwealth departments and authorities, State government departments and authorities, and private enterprises.

D.7 Sources of expenditure from Research Trust Funds

There are a number of possible ways of presenting information on support for S&T resulting from the operation of research trust funds. There are four figures for expenditure which should be considered:

R, the total R&D (or S&T) expenditure from the trust fund account in the particular year;

C, the Commonwealth contributions to the trust fund account in that year in respect of the Commonwealth's support for research;

A, any Commonwealth appropriation to the trust fund account in respect of industry (or other) contributions to the Consolidated Revenue Fund for the purposes of the particular trust fund; and

I, the industry (or other) contribution in that year (usually a levy or tax).

In presenting information on trust fund support for S&T in the Science and Technology Statement, it has been our aim to seek a reporting method which, at least over a period of years, will tend to represent accurately the total of those components of expenditure from the fund which are attributable to Commonwealth contributions. A corollary of this is that we seek a similarly accurate representation with respect to industry (or other non-Commonwealth) contributions. The major classes of trust funds dealt with in the Statement were treated as follows.

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(4) See for example 1985-86 Budget Paper No. 1, Statement 6, p369 & ff, and Budget Paper No 6 (Portfolio Program Estimates).

1. Funds where Commonwealth support is matched to the level of expenditure from the trust account.

   (i) Commonwealth Budget sector net expenditure.
   C only is shown. (N.B. A is omitted since Commonwealth net expenditure only is sought).

   (ii) Commonwealth Non-budget sector.
   There is no expenditure shown in this sector.

   (iii) Other.
   R-C is shown since this expenditure can be attributed to industry (or other) contributions.

2. Funds where Commonwealth contributions are not matched to the level of expenditure from the trust account.

   (i) Commonwealth Budget sector net expenditure.
   C only is shown, unless the Commonwealth component of R is less than C - in this case only that component is shown (e.g., where the Commonwealth contribution to the fund matches other contributions $:$, R/2 is shown).

   (ii) Commonwealth Non-budget sector.
   Expenditure is shown (if any) which is attributable to Commonwealth contributions in previous years (e.g., where the Commonwealth contribution to the fund matches other contributions $:$, 1/2 (R-C-I) is shown).

   (iii) Other.
   The amount shown here is the remainder after subtracting any amounts shown under (i) and (ii) from R.

Where the details of trust fund expenditure have been published in the annual Report of the Auditor-General upon Financial Statements prepared by the Minister for Finance, we have drawn on the Report to derive the figures for R, C, and I.

.8 Allocation of expenditure by socio-economic objective

The socio-economic objective classes used in the Statement represent an amalgamation f those used in the Project SCORE R&D survey, as follows:

cience and Technology Statement	Project SCORE (as updated for 1984-85 Survey)
EFENCE	DEFENCE
GRICULTURE	AGRICULTURE - Agriculture: Animal (incl. Pastures) - Agriculture: Plant - Agriculture: Soils (Conservation Science, etc) - Agriculture: Other
THER PRIMARY INDUSTRIES	OTHER PRIMARY INDUSTRIES - Forestry: Commercial - Forestry: Other - Fisheries
INING	MINING OF NON-ENERGY MINERALS (incl. Safety and Environmental Protection) - Prospecting and Resource Assessment Techniques: Metallic Minerals (other than Uranium) - Prospecting and Resource Assessment Techniques: Other - Extraction Techniques: Metallic Minerals (other than Uranium) - Extraction Techniques: Other
NUFACTURING	MANUFACTURING INDUSTRY (including R&D likely to benefit Manufacturing Industry eg R&D into manufacturing processes) - Food - Beverages and Tobacco - Textiles and Textile Products - Clothing and Footwear - Wood, Wood Products and Furniture - Paper and Paper Products, Printing & Publishing - Chemical, Petroleum & Coal Products: Chemical Fertilisers - Chemical, Petroleum & Coal Products: Veterinary Products - Chemical, Petroleum & Coal Products: Pharmaceuticals - Chemical, Petroleum & Coal Products: Other - Non-metallic Mineral Products - Basic Metal Products - Fabricated Metal Products - Transport Equipment - Medical & Surgical Equipment

- Scientific Equipment
- Photographic Equipment
- ADP Equipment
- Telecommunications & Broadcasting Equipment
- Electronic Equipment n.e.c.
- Electrical Machinery & Equipment n.e.c.
- Agricultural Machinery
- Construction Machinery
- Industrial Machinery & Equipment n.e.c.
- Miscellaneous Manufacturing (Leather, Rubber Plastic, etc.

ENERGY

PRODUCTION AND UTILISATION OF ENERGY
From Oil and Gas (excl. Oil Shale and Tar Sands)

- Refining, Transport and Storage
- Other (eg Safety, Envionmental Protection)

From Oil Shale and Tar Sands

- Refining, Transport and Storage
- Other (eg Safety, Environmental Protection)

From Coal

- Preparation and Transport (eg Coking, Blending)
- Combustion
- Other (eg Safety, Environmental Protection)

Solar Energy

- Heating and Cooling
- Photo Electric
- Thermal Electric

Nuclear Non-Breeder

- Light Water Reactor (incl. Safety etc.)
- Other Converter Reactor (incl. Safety, etc.)
- Fuel Cycle (excl. Mine Site Aspects), including Conversion Enrichment, Recycling, Transport, Treatment and Disposal
- Supporting Technologies (excl. Mine Site Aspects) including Safety, Environmental Protection, etc. relating to the Fuel Cycle

Nuclear Breeder

Nuclear Fusion

Other Primary Sources

- Wind
- Ocean
- Geothermal Energy
- Other Sources and New Vectors (eg Bagasse)

PRODUCTION AND UTILISATION OF SYNTHETIC FUELS

From Coal Conversion (eg Gasification)
From Biomass

CONSERVATION OF ENERGY

In Industry
Residential and Commercial
Transportation (eg Fuel Savings, Public Transport)
Other (eg Heat Pump, Waste Recycling)

OTHER ENERGY R&D

Electric Power Conversion (eg Generation, Pollution Aspects)
Electicity Transmission and Distribution
Energy Storage n.e.c.
Energy Systems Analysis (eg Sociological, Economical and Environmental Aspects n.e.c.)
Other (eg Dissemination)

MINING OF ENERGY MINERALS

Extraction Techniques
- Uranium
- Coal
- Oil and Gas (excl. Oil Shale and Tar Sands)
- Oil Shale and Tar Sands

Prospecting and Resource Assessment Techniques
- Uranium
- Coal
- Oil and Gas (excl. Oil Shale and Tar Sands)
- Oil Shale and Tar Sands

Other (eg Safety, Environmental Protection)
- Uranium
- Coal
- Oil and Gas (excl. Oil Shale and Tar Sands)
- Oil Shale and Tar Sands

RANSPORT

TRANSPORT

- Road accidents & safety
- Other road
- Railway
- Water transport
- Air transport
- Multimodal transport
- Intermodal materials handling
- Other transport

OMMUNICATIONS

COMMUNICATIONS

- Broadcasting
- Telecommunications

Postal Communications
Other Communications

ECONOMIC SERVICES N.E.I.	COMMERCIAL ACTIVITIES - Wholesale and Retail Trade - Banking, Finance and Insurance - Other Commercial Activities
	MISCELLANEOUS PUBLIC SERVICES - Water Supply (excl. Water Pollution) - Waste Disposal and Recycling - Fire Protection
	ECONOMY (incl. National, State and Regional Economies) - Overseas Trade - Productivity n.e.c. - Industrial Relations - R&D relating to Economic Data Collection and Modelling - Economic Activities n.e.c.
ENVIRONMENT (incl. Protection and Rehabilitation)	ENVIRONMENT - Air Pollution - Water Pollution - Other Pollution - Other Environment: Natural - Other Envirohment: Human
URBAN AND REGIONAL PLANNING	URBAN AND REGIONAL PLANNING - Housing (except Construction Aspects) - Urban and Regional Planning
HEALTH	HEALTH: PRE-AND PARA-CLINICAL
	HEALTH: CLINICAL (Organs, Diseases and Conditions) - Acquired Immune Deficiency Syndrome (AIDS) - Arthritic and Rheumatic - Other Diseases and Conditions mainly affecting the Aged - Cancer - Cardio-vascular and Haemopoietic: Heart - Cardio-vascular and Haemopoietic: Blood - Cardio-vascular and Haemopoietic: Other - Diabetes - Other Endocrinal - Malaria - Infective and Parastic n.e.c. - Mental Health - Multiple Sclerosis - Neural n.e.c. - Pain - Spina Bifida

	- Other Birth Defects and Congenital Diseases - Sudden Infant Death Syndrome - Exocrinal n.e.c. - Gastrointestinal, Metabolic and Hepatic n.e.c. - Muscular and Skeletal n.e.c. - Oro-dental (incl. Speech) - Renal and Urological - Reproductive - Respiratory - Skin and Connective Tissue n.e.c. - Vision, Hearing and Other Sense Organs - Other Organs, Diseases and Conditions - Clinical Health not specific to particular Organs, Diseases and Conditions
	HEALTH: PUBLIC - Addiction: Alcohol and Tobacco - Addiction: Other Drugs - Health Services and Education - Environmental Health - Occupational Health - Other Public Health
EDUCATION	EDUCATION - Special - General
WELFARE	SOCIAL DEVELOPMENT AND WELFARE SERVICES - Unemployment/Unemployed - Working Conditions (excl. Industrial Relations, Occupational Health) - Aboriginal Welfare and Development - Migrant Welfare and Development - Aged Persons Welfare and Development - Youth/Child Welfare and Development - Family Welfare and Development - Invalid, Handicapped Persons Welfare and Development - Social Development and Welfare Services n.e.c.
COMMUNITY SERVICES N.E.I.	MISCELLANEOUS COMMUNITY SERVICES AND OBJECTIVES - International Relationships or Objectives (eg Peace) - R&D Primarily for the Benefit of Other Countries - Consumer Affairs - Public Administration: Information Manipulation/Dissemination - Public Administration: Other - Law Reform - Law Enforcement - Corrective Services - Sport - Culture - National and Other Parks - Other Recreation and Tourism

EARTH, OCEAN, ATMOSPHERE AND SPACE	ADVANCEMENT OF KNOWLEDGE OF THE PHYSICAL ENVIRONMENT (excl. aspects covered under ENVIRONMENT) - Earth (except Mining Aspects) - Ocean (except Fisheries Aspects) - Atmosphere (incl. Meteorology) - Remote Sensing - Space
GENERAL ADVANCEMENT OF KNOWLEDGE	GENERAL ADVANCEMENT OF KNOWLEDGE - Natural Sciences and Engineering - Social Sciences and Humanities
	OTHER R&D N.E.C.

Some particular cases requiring special note are:

- All grants by the Department of Education, and those recommended by the Tertiary Education Commission, for research in the higher education sector have been allocated to the socio-economic objective "General advancement of knowledge". This accords with international practice as embodied in the biennial International Survey of the Resources Devoted to Research and Experimental Development by OECD Member Countries, where the guidelines for the 1979 survey include the following:

  > "Please include in General Advancement of Knowledge all R&D financed by general public university grants from the Ministry of Education although, in certain Member countries, some of these programs may be relevant to other objectives. This is a convention dictated by the difficulty of distributing these funds by objective in many Member countries."

  Should a distribution of these grants over other socio-economic objectives be required, the Project SCORE data may be used as a rough guide. Percentages of Commonwealth funded higher education sector R&D expenditures by broad socio-economic objective category reported for 1981 were Advancement of knowledge, 48%; Community welfare, 28%; and Economic development 24%.

- In Science Statement 1979-80, the Project SCORE mining objectives relating to energy minerals were included in the category "Mining". In subsequent Statements, as noted above, they are included in the category "Energy".

- In Science Statement 1979-80, expenditures of Commonwealth Serum Laboratories (CSL) were classified to the objective "Manufacturing" in accordance with the location of "Pharmaceuticals" in the classification scheme. In subsequent Statements, taking account of the objectives of CSL, these expenditures have been classified in the category "Health".

.9 Allocation of expenditures by discipline-related field

Users of the S&T Statement have sometimes sought an allocation of R&D/S&T ommonwealth expenditures by field of research or discipline. At present, a lassification of such a type can only be found (for R&D activities) in the ABS R&D survey ata.

For the first time, on an experimental basis, the present Statement includes a iscipline-related classification (Table 6, p.15-16), as a response to user requests. hese data should be regarded as indicative only. The collection unit for the Science nd Technology Statement survey is based on socio-economic objective. About 350 forms are eceived from respondents on this basis. The following ad hoc discipline-related fields ave been derived for this Statement. Each form has been allocated to one of these fields n the basis of estimates by the Department of Science. Clearly since many forms will verlap more than one field there are many approximations in this process.

.	Engineering and Technology - Defence Application	Includes practically all R&D/S&T whose sole or main beneficiary is National Defence and Security.
.	Engineering and Technology - Resources Application	Mining and Chemical engineering, Metallurgy, Food technology, Textile technology, Material science, etc.
.	Engineering and Technology - Technology-intensive Industries	Aeronautical and Space engineering, Electrical and Electronic engineering, Mechanical engineering, System analysis, Sunrise technology, etc.
.	Engineering and Technology - Service Application	Civil, Traffic and Communication engineering, Architecture, Construction science, etc.
.	Physics and Mathematics	Includes, eg, Astronomy and most of the non-applied Exact sciences.
.	Atmospheric and Space Science	Meteorology and associated sciences, knowledge of the Spacecraft-accessible space.
.	Energy Disciplines	Fuel and Power, Nuclear engineering, Petroleum technology, Power generation including hydroelectrical, etc.
.	Chemistry	Physical, Organic, Inorganic, Analytical, Theoretical, Biochemistry, etc.
.	Earth Resources	Geography, Geology, Geochemistry, Geophysics, Geodesy, Cartography, Surveying, Mineralogy, Exploration, etc.
0.	Water Resources and Physical Environment	Fresh water Hydrology, Water engineering (not included in 4 above), Remote Sensing, Geomorphology, non strictly biological Environmental protection, etc.
1.	Marine Sciences	Oceanography, Marine Biology, Fisheries research, etc.
2.	Applied Biology and Living Environment	Flora, Fauna, Ecology, Forestry science, Land rehabilitation, etc.

13.	Health and Medical Sciences	Medicine, Surgery, Dentistry, Optometry, Orthopaedy, Medical Psychology, Human Biology, Physics and Chemistry applied to health, etc.
14.	General Biology	All biological and life science not elsewhere included; including physical Anthropology, Biogeography, etc.
15.	Rural Sciences	Biology applied to agriculture, Agronomy, Animal Husbandry, Veterinary science, Soil science, Agricultural engineering, Agricultural economics, etc.
16.	Business and Information Science	Accounting, Economics, Human and Economic Geography, Information and Communication Science, including journalism and Modern Languages, Management, commercial application of Computer science, Applied Statistics, etc.
17.	Humanities and Social Science	Arts, Education, Law, Linguistics, History, Philosophy, Political Science, Sociology, and other SSH not elsewhere classified.

D.10 Distinction between "advancement of knowledge" and basic research

Some readers of the Science Statement 1979-80 assumed a correspondence between the socio-economic objective category "advancement of knowledge" and the type of activity "basic research". A broad summary of General Government sector (i.e. Commonwealth plus State) intramural R&D expenditure data from the 1981-82 SCORE survey illustrates the difference.

Table 28 R&D in the General Government Sector 1981-82 - Objective category by type of activity

($ million)	Type of activity			
Objective category	Basic research	Applied research	Experimental development	Total
National security	10.6	70.6	31.9	113.2
Economic development	132.6	255.8	67.5	455.9
Community welfare	28.3	35.8	5.4	70.5
Advancement of knowledge	48.0	12.3	8.4	68.7
Total	219.6	375.5	113.3	708.3

The basic research performed in objective categories other than "advancement of nowledge" is classified as basic because it has no "particular application or use in iew" but satisfies the SCORE definition of strategic basic research, namely "research irected into specified broad areas in the expectation of useful discoveries. It provides he broad base of knowledge necessary for the solution of recognised practical problems."

Valid entries in the type of activity classes "applied research" and experimental development" in the objectives category "advancement of knowledge" would be ssociated with developments which" could ultimately contribute to several specific bjectives in ways that do not allow one such objective to be selected as predominant".

On theoretical grounds, the figure for "basic research" in the objectives ategory "advancement of knowledge" should be an estimate of expenditure on "pure basic esearch", defined in Project SCORE as "research which is carried out without looking for ong term economic or social benefits other than advancement of knowledge". In fact, two hirds of the $48.0m in this category was reported as "pure basic research", and $5.2m of 'pure basic research" was reported outside the category.

The Statement does not attempt to distinguish between basic research, applied esearch, and experimental development.

.11 Estimation of trends in real terms

Expenditures in Statements prior to 1983-84 were presented only in current prices .e. in actual money terms. It is of course desirable to examine trends in real terms, aking account of changes in prices. The most acceptable presentation is to provide stimates of all expenditures at constant prices (6). In the absence of known price ariations for all goods and services purchased, it is usual for such estimates to be onstructed using price indices for various broad categories of expenditure and quantity eights representing the relative contributions of these categories to the total xpenditure.

Implicit price deflators are obtained by dividing aggregate flows of goods and ervices measured at current prices by the corresponding estimates at constant prices. hus they are derived measures (hence the term 'implicit') and are not direct measures of rice changes by which current price estimates are converted to estimates at constant rices. When calculated from the major national accounting aggregates, such as xpenditure on gross domestic product (giving the GDP implicit price deflator), implicit rice deflators relate to a generally broader scope of goods and services in the economy han that represented by any of the individual retail and wholesale price indexes that are ublished by the Australian Bureau of Statistics. The usefulness of implicit price eflators as indicators of price change is greatly limited by a number of factors (6). evertheless, because of the difficulty of constructing accurate R&D deflators, the Gross on farm IPD has been the deflator most commonly used for this purpose.

There is an extensive literature on this subject and readers are cautioned that hile studies have shown that at the national and broad sector levels the GDP implicit rice deflator has often given acceptable estimates of constant price R&D expenditures, here are many examples where it has not. In these cases the estimated R&D price eflators have usually increased more rapidly than the GDP implicit price deflator. At he individual program and ministry levels, there can be marked variations from the price ises indicated by one or more of the broad aggregate deflators, due both to phasing of xpenditures and the phasing and magnitudes of individual price changes of the goods and ervices actually purchased.

A major inhibiting factor in the presentation of estimated constant price expenditures in earlier Statements was the absence of a fully satisfactory salaries index appropriate to Commonwealth research personnel. A simple research scientists and engineers salaries index was constructed for the Statement on a basis adequate for establishing trends using data at two- or three-year intervals, but this index (which took salaries at a fixed time in each year) did not adequately account for variations in the timing of new awards from year to year and was unsuitable for use with data at annual intervals. Using Public Service Board data on the timing of all salary adjustments for selected grades since 1976, we have developed a Commonwealth research salary payment index as a replacement. This is based on the total annual salary payments attributable to a fixed 'basket' of personnel relevant to a research organisation. The personnel grades selected, and the weighting given to each in the construction of the index, were based on a study of the staff structure of CSIRO. This index, and others used in the derivation of constant price estimates used in this Statement, are presented in Table 29. Table 11 illustrates the application of the deflators to expenditure classified according to socio-economic objectives.

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(6) Australian National Accounts, National Income and Expenditure 1983-84, Australian Bureau of Statistics, Catalogue No. 5204.0, pp 79-81.

TABLE 29: Deflator series relevant to Commonwealth-funded R&D

Price Index or Deflator	Index Values for Year (1979-80 = 100)									
	76-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	Projected 85-86
A. GDP implicit price deflator(IPD)	77.4	83.4	90.0	100.0	110.4	121.6	134.6	144.8	153.7	not est
B. Gross non-farm IPD	78.8	85.3	91.1	100.0	110.5	123.3	136.9	147.6	157.0	168.0 est*
C. Government final consumption expenditure IPD	79.4	85.9	91.5	100.0	112.3	127.2	139.8	148.1	157.0	168.0 est*
D. Consumer price index 1	76.7	83.9	90.8	100.0	109.4	120.8	134.7	144.0	150.1	162.1 est*
E. Commonwealth research salary payment index 2	82.7	88.4	92.9	100.0	114.0	133.4#	145.2	152.3	159.9	168.4 est*
F. Private non-dwelling construction IPD 3	77.4	84.2	90.4	100.0	112.2	126.7	143.9	151.1	160.1	171.3 est*
G. Private enterprise intramural R&D expenditure IPD 4	74.6	82.5	91.3	100.0	114.0	130.0	142.0	155.0	164.9	176.5 est*
H. Universities aggregate price deflator 5	80.9	87.1	92.2	100.0	114.2	126.9	139.3	147.1	156.1	167.0 est*
I. ABS R&D other capital expend. deflator 6	73.6	81.0	86.0	100.0	103.5	117.6	129.8	139.1	142.9	152.9 est*
J. ABS R&D non-salary current expenditure deflator 6	79.2	84.9	91.5	100.0	110.2	128.2	140.9	149.2	158.3	169.4 est*
K. Commonwealth extramural R&D payments deflator 7	n.a.	n.a.	92.0	100.0	112.0	131.3	143.1	150.8	158.5	167.8 est*
L. Private Equipment IPD 8	72.7	82.0	90.8	100.0	109.5	117.8	130.0	139.4	143.1	153.1 est*

Sources : Budget papers, ABS bulletins and unpublished data, Commonwealth Tertiary Education Commission data, Department of Science unpublished data based on Public Service Board salaries information.

* DOS estimates based on assumptions in the Budget Papers for 1985-86 (ie, GDP non-farm deflator to increase 7%, CPI to increase by 8%) and on the proposed 2% discounting of CPI for the April 1986 National Wage Case.

# Takes account of an additional pay period falling during 1981-82 in that application of this value also adjusts deflated expenditure to a 26-pay period basis. (Australian Public Service salaries are paid on a fortnightly basis and at eleven or twelve year intervals there are 27 payments rather than 26.) For applications where the adjustment is not desired use 128.4.

1 Figures derived by DOS from original series having a 1980-81 base.

2 This index is based on the total annual salary payments attributable to a fixed 'basket' of personnel relevant to a research organisation. The personnel grades selected, and the weighting given to each in the construction of the index, were based on a study of the staff structure of CSIRO.

3 A public non-dwelling construction deflator is available to 1981-82 in unpublished working estimates of the ABS. The private construction deflator is used here as there are published figures after 1981-82 and the quarterly publication of the series facilitates estimation for the current year.

4 Estimated by DOS using the current constant 1979-80 price figures for the years 1976-77, 1978-79, 1981-82 and 1983-84 published by ABS (Catalogue No 8114.0) with interpolation of the deflator for missing years on the basis of constant annual percentage changes between the given years. In addition to noting the uncertainty introduced by using an interpolated figure for the base year, 1979-80, readers should be aware that the ABS sees the constant price estimates in Cat. No. 8114.0 as less reliable than most published ABS constant price data.

5 This deflator is based on indices maintained by CTEC for adjusting recurrent grants to higher education institutions for cost increases. See Appendix 11, Vol. 4 of the CTEC Report for the 1982-84 triennium.

6 These series are unpublished working estimates made available by ABS.

7 Used to deflate extramural payments made by agencies to other Commonwealth bodies. Based on weighting factors derived from an analysis of 'Other Source' (ie, excluding Budget and Non-budget) expenditure for the Science Ministry and applied to other indices.

8 Derived from ABS Catalogue No 5206.0, June Quarter 1985.

Outline of the application of indices in the derivation of the constant price estimates

- For capital land and building expenditure - series F.
- For capital equipment expenditure - series I.
- For wages and salaries - series E.
- For other current expenditure - series J.
- For extramural expenditures - series B, D, G, H or K were used according to the destination of the funds.

D.12 Treatment of taxation concessions associated with R&D

Revenue forgone by the Commonwealth as a result of taxation concessions relating to R&D expenditure may be regarded as a form of Commonwealth funding of R&D. Estimates of costs borne by the revenue in respect of R&D performed by business enterprises can vary widely according to the viewpoint adopted and the timescale considered, because in the longer term industrial R&D is a profitable investment at the sector level, and may therefore be expected to increase taxation revenue in the future. Because of the difficulty of estimating appropriate amounts, no allowances for taxation concessions have been included in the tables presented in this Statement.

In years subsequent to 1983-84 the operation of the Management and Investment Companies Act 1983 will provide substantial taxation concessions to promote a private sector venture capital market that will encourage formation and development of Australian businesses which utilise innovative technology, have potential for rapid growth, are skill intensive, export oriented, internationally competitive, and significant generators of employment in Australia. The considerations discussed in the paragraph above also apply to revenue foregone by the Commonwealth under this scheme.

APPENDIX E
ACRONYMS, ABBREVIATIONS AND SYMBOLS

(a)	Intramural Capital Expenditure
AAEC	Australian Atomic Energy Commission
AAECP	Asean Australian Economic Co-Operation Program
AAHQS	Australian Agricultural Health and Quarantine Service
AATB	Anglo-Australian Telescope Board
(ab) or $\binom{a}{b}$	Total Intramural Expenditure
ABAH	Australian Bureau of Animal Health
ABC	Australian Broadcasting Commission
ABN	Australian Bibliographic Network
ABRS	Australian Biological Resources Study
ABS	Australian Bureau of Statistics
ABT	Australian Broadcasting Tribunal
ACC	Australia-China Council
ACER	Australian Council for Educational Research
ACIAR	Australian Centre for International Agricultural Research
ACT	Australian Capital Territory
ACTU	Australian Council of Trade Unions
ADAB	Australian Development Assistance Bureau
ADACS	Australian Development Assistance Courses
ADP	Automatic Data Processing
AEC	Australian Education Council
AFIC	Australian Feeds Information Centre
AFIT	Australian Families Income Transfer
AFP	Australian Federal Police
AGAL	Australian Government Analytical Laboratories
AHRC	Australian Housing Research Council
AIA	Automotive Industry Authority
AIAS	Australian Institute of Aboriginal Studies

AIMA	Australian Institute of Multicultural Affairs
AIMS	Australian Institute of Marine Science
AIRDIB	Australian Industrial Research and Development Incentives Board
AIRDIS	Australian Industrial Research and Development Incentives Scheme
AIUS	Australian Institute of Urban Studies
AMEP	Adult Migrant Education Program
AMSTAC	Australian Marine Sciences and Technologies Advisory Committee
ANAHL	Australian National Animal Health Laboratory
ANARE	Australian National Antarctic Research Expeditions
ANMRC	Australian Numerical Meteorology Research Centre
ANPWS	Australian National Parks and Wildlife Service
ANU	Australian National University
ANZAAS	Australian New Zealand Association for the Advancement of Science
A of K	(general) Advancement of Knowledge
AOFR	Australian Optical Fibre Research
APC	Australian Productivity Council
APM(RP)	Australian Population and Migration (Research Program)
ARGC	Australian Research Grants Committee (Since 1981 incorporated in QEFARGC)
ARGS	Australian Research Grants Scheme
ARL	Australian Radiation Laboratory
ARRB	Australian Road Research Board
ARRDO	Australian Railway Research and Development Organisation
ASAT	Australian Scholastic Aptitude Test
ASCA	Association for Science Cooperation in Asia
ASCO	Australian Standard Classification of Occupations
ASEAN	Association of South-East Asian Nations
ASTEC	Australian Science and Technology Council
ATAC	Australian Transport Advisory Council
ATS	American Telecommunications Satellite
AUBRCC	Australian Uniform Building Regulations Coordinating Council

AUSINET	Australian Information Network (Data Base Network)
AUSSAT	Australian (telecommunications) Satellite
Australia Post	Australian Postal Commission
AUSTRE	Australian Scientific and Technological Reports (data base)
AUSTREC	Australian Science, Technology and Research Co-operation (ADAB)
AWRAC	Australian Water Research Advisory Council
AWRC	Australian Water Research Council
AXE	A type of digital telephone exchange
(b)	Intramural Current Expenditure
BAE	Bureau of Agricultural Economics
BE	In this Statement Refers to Wholly Owned Commonwealth Business Enterprises
BERD	Total Intramural R&D Expenditure in the Business Enterprise Sector
BIE	Bureau of Industry Economics
BLMR	Bureau of Labour Market Research
BMR	Bureau of Mineral Resources, Geology and Geophysics
BMRC	Bureau of Meteorology Research Centre
BTE	Bureau of Transport Economics
(c)	Extramural Expenditure
CAD	Computer Assisted Design
CAI	Council of Australian Industry
CAM	Computer Assisted Manufacture
CCAMLR	Convention on the Conservation of Antarctic and Marine Living Resources
CCRD	Consultative Committee on R&D (ADAB)
CEDA	Committee on the Economic Development of Australia
CERI	OECD Centre for Educational Research and Innovation
CDC	Curriculum Development Centre
CFI	Commonwealth Forestry Institute (UK)

CGIAR	Consultative Group on International Agricultural Research
CHOGRM	Commonwealth Heads of Government Regional Meeting
CILES	Central Information, Library and Editorial Section (CSIRO)
CIM	Computer Integrated Manufacturing
CIRC	Centre for International Research Cooperation (CSIRO)
CIRL	Central Investigation and Research Laboratory
CITCA	Committee of Inquiry into Technological Change in Australia
CMRAC	Department of Veterans' Affairs Central Medical Research Advisory Committee
CNRD	(a project of the Reserve Bank of Australia aimed at producing a more secure and cost-effective Bank note)
COALSCAN	(a CSIRO-developed on-line coal ash analyser)
COSSA	Central Office of Space Science and Application
COST	ASEAN Committee on Science and Technology
CPI	Consumer Price Index
CSIRO	Commonwealth Scientific and Industrial Research Organization
CSIRONET	National Computer Network Operating within Australia
CSL	Commonwealth Serum Laboratories
CTEC	Commonwealth Tertiary Education Commission
CTHC	Capital Territory Health Commission
CWLTH	Commonwealth Government (i.e., Australian Federal Government)
DAF	Data Acquisition Facility
DDG	(Guided missile destroyer)
DIEA	Department of Immigration and Ethnic Affairs
DISCON	Defence Integrated Secure Communication Network
DITAC	Department of Industry, Technology and Commerce
DNA	Deoxyribonucleic Acid
DOS	Department of Science
DPF	Data Processing Facility
DPI	Domestic Product of Industry

DSS	Department of Social Security
DST	Department of Science and Technology
DSTO	Defence Science and Technology Organisation
EBS	Experimental Building Station
ELD	Education and Local Development Project
EP	Employee Participation
EPG	Education Planning Group
ERDC	Education Research and Development Committee
ESCAP	Economic and Social Commission for Asia and the Pacific
ESL	English as a Second Language
FAP	Fellowships Advisory Panel
FE	Commonwealth Financial Enterprise
FFG	(guided missile frigates)
FM	Frequency Modulation
FPS	Facility Planning System
FRAN	Flight-data Recorder Analysis (Station)
FRG	Federal Republic of Germany
FWRAP	Federal Water Resources Assistance Program
GATT	General Agreement of Trade and Tariffs
GBRMPA	Great Barrier Reef Marine Park Authority
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on Research and Development
HACBSS	Homestead and Community Broadcast Satellite Service
HF	High Frequency
HIAF	Heavy Ion Analytical Facility
HIF	Health Facilities Information File
HIFAR	High Flux Australian Reactor

IAC	Industries Assistance Commission
IAEA	International Atomic Energy Agency
ICAO	International Civil Aviation Organisation
ICI	Imperial Chemical Industries
ID	Industrial Democracy
IDC	International Data Centre
IDCA	Industrial Design Council of Australia
IDP	International Development Program
IEA	International Association for the Evaluation of Educational Achievement
IMPACT	A project of analysis of economic and social issues (see A.16.2)
INMARSAT	International Maritime Satellite Organisation
INTELSAT	International Telecommunications Satellite
IOC	International Oceanographic Commission
IPD	Implicit Price Deflator
IPS	Ionospheric Prediction Service
IR	Industrial Relations
IRAS	Indicators and Resource Analysis Section. (Department of Science)
IR&D	Industrial Research and Development
ISCED	International Standard Classification of Education
JIT	Just in Time
W	Kilowatt
andsat	NASA Remote Sensing Satellite
INAC	Electronic Linear Accelerator
td	Limited Liability
ARC	Machine Readable Cataloging
ATPAK	Materials Handling Program
CB	Metric Conversion Board

MEDLINE	U.S. National Library of Medicine (Database Network)
MELTFLOW	(a CSIRO-developed technology for metal-resting control)
MERLCO	Minerals (Exploration) Research Liaison Committee
MICs	Licenced Management and Investment Companies
MLS	Australian Microwave Landing System (INTERSCAN)
MP	Member of (the lower house of) the Parliament (of Australia)
MPC	Multi-Project Silicon Wafer Chip
MTIA	(see AIA)
MW	Megawatt
N	Natural Sciences and Engineering
n.a.	not available
NAL	National Acoustic Laboratory
NASA	United States National Aeronautics and Space Administration
NATA	National Association of Testing Authorities
NATmap	Division of National Mapping (Department of Resources and Energy)
NBSL	National Biological Standards Laboratory
NCC	National Climate Centre
NCDC	National Capital Development Commission
n.e.c.	not elsewhere classified
n.e.i.	not elsewhere included
NERD&D	National Energy Research, Development and Demonstration
NERDDC	National Energy Research, Development and Demonstration Council
NH&MRC	National Health and Medical Research Council
NHTAP	National Health Technology Advisory Panel
NIF	National Income Forecasting Model
NITC	National Information Technology Council
sN	Includes a small component of social sciences
NL	No liability

NMC	Nuclear Monitoring Centre
NMR	Nuclear Magnetic Resonance
NMRI	Nuclear Magnetic Resonance Imaging
NPAAC	National Pathology Accreditation Advisory Council
NPRU	National Police Research Unit
NSC	National Standards Commission
NSE	Natural Sciences and Engineering
NSW	New South Wales
NT	Northern Territory (of Australia)
NWRAP	National Water Resources Assessment Program
NZ	New Zealand
OECD	Organization for Economic Co-operation and Development
OTC	Overseas Telecommunications Commission (Australia)
OTHR	Over the Horizon RADAR
PABX	Priority Automatic Branch Exchange
PEP	Participation and Equity Programs
PhD	Doctor of Philosophy
PM	Prime Minister (of Australia)
PR&I	Planning Research and Information Branch (Public Service Board)
PROLOG	A language for 5th Generation Computers
PSZ	Partially-Stabilized Zirconia
Pty	Proprietary
QEFARGC	Queen Elizabeth II Fellowships and Australian Research Grants Committee
QEII	(Her Majesty) Queen Elizabeth the Second
QEM*SEM	(a CSIRO-developed system for mineral analysis)
QFMRAAC	Queen's Fellowships and Marine Research Allocations Advisory Committee
QLD	Queensland

RAAF	Royal Australian Air Force
RAN	Royal Australian Navy
RAPT	Review and Progress Test in Mathematics
RCF	(Ministerial) Review of Commonwealth Functions (April 1981)
R&D	Research and (Experimental) Development
R,D&D	Research, Development and Demonstration
RV	Research Vessel
S	Social Sciences and Humanities
^{n}S	Includes some Natural Science and Engineering
SA	South Australia
S&T	Science and Technology
SCORE	Survey and Comparison of Research Expenditure
SEAMEO	South East Asian Ministers for Education Organisation
SIRO-CT	(a CSIRO-developed strain of egg-hens)
SIROTECH	(an incorporated company for pomoting CSIRO inventions and technology in industry)
SMEC	Snowy Mountains Engineering Corporation
SPC	South Pacific Commission
SSH	Social Sciences and Humanities
STA	Scientific and Technological Activities
STET	Scientific and Technical Education and Training
STIU	OECD Science and Technology Indicators Unit
STS	Scientific and Technological Services
TAFE	Technical and Further Education
TAS	Tasmania
Telecom	Australian Telecommunications Commission
TTC	Technology Transfer Council
UHF	Ultra High Frequency

UK	United Kingdom of Great Britain and Northern Ireland
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organisation
US	United States (of America)
USA	United States of America
USPA	United States Patent Office
USSR	Union of Soviet Socialist Republics
WA	Western Australia
WELSTAT	Welfare Statistics Collection Project
WHO	World Health Organisation
WIPO	World Intellectual Property Organisation
Vic.	Victoria (Australia)
VLSI	Very Large Scale Integrated Circuits
..	Figure non-zero, but insignificant for purposes of presentation.
.	Figure non-zero but not separately available is included elsewhere.

APPENDIX F

COMMONWEALTH AGENCIES WITH SIGNIFICANT S&T ACTIVITY

- Albury-Wodonga Development Corporation (Department of Local Government and Administrative Services), p 119 (04-16)

- Anglo-Australian Telescope Board (DOS), p 44, 151 (05)

- Antarctic Division (DOS), p 42, 146 (06-09-10-11)

- Australian Atomic Energy Commission (Department of Resources and Energy), p 39, 35, 39, 42, 140 (03-05-07)

- Australian Agricultural Health & Quarantive Service (Department of Primary Industry), p 28, 126 (15)

- Australian Bureau of Statistics (Treasury), p 37, 38, 192 (16)

- Australian Centre for International Agricultural Research (Foreign Affairs), p 41, 95 (15)

- Australian Development Assistance Bureau (Foreign Affairs), p 41, 93 (02 to 18)

- Australian Government Analytical Laboratories (Science), p 146 (08-13)

- Australian Industrial Research and Development Incentives Board (DITAC), p 2, 32, 112 (03)

- Australian Institute of Marine Science (Science), p 42, 152 (11)

- Australian Institute of Multicultural Affairs (Immigration and Ethnic Affairs), p 106 (17)

- Australian Landsat Station (Resources and Energy), p 139 (09-10)

- Australian Radiation Laboratories (Health), p 98 (13)

- Australian Railway Research and Development Organisation (Transport), p 178 (04-16)

- Australian Research Grants Scheme (Science), p 44, 149 (01 to 18)

- Australian Road Research Board (Transport), p 36, 178 (04-16)

- Australian Science and Technology Council (Prime Minister and Cabinet), p 132, 154 (01 to 18)

- Australian Survey Office (Local Government and Administrative Services), p 118 (09-16)

- Bureau of Agricultural Economics (Primary Industry), p 124 (15)

- Bureau of Flora and Fauna (Arts, Heritage and Environment), p 60 (12)

- Bureau of Industry Economics (DITAC), p 110 (16)

- Bureau of Meteorology (Science), p 42, 58, 146 (06)
- Bureau of Mineral Resources (Resources and Energy), p 31, 35, 42, 137 (02-07-09)
- Bureau of Transport Economics (Transport), p 179 (04-16)

- Central Investigation and Research Laboratories (Housing and Construction), p 104 (04)
- Commission for the Future (Science), p 1-151 (03 to 14)
- Commonwealth Institute of Health (Health), p 97 (13)
- Commonwealth Scientific and Industrial Research Organisation (Science), p 29 to 44, 153-170 (02 to 16)
- Commonwealth Serum Laboratories (Health), p 39, 101 (13)
- Commonwealth Tertiary Education Commission (Education), p 40, 86-88 (01 to 18)

- Defence Science and Technology Organisation (Science), p 27, 80 (01)
- Department of Education (Post-Graduate Awards), p 86 (17-18)
- Division of National Mapping (Resources and Energy), p 139 (09)

- Federal Water Resources Assistance Program (Resources and Energy), p 136 (10)

- Great Barrier Reef Marine Park Authority (Arts, Heritage and Environment), p 44, 61 (11)

- Industries Assistance Commission (DITAC), p 116 (02 to 04-16)
- Institute of Health (Health), p 99, (13)
- Ionospheric Prediction Service (Science), p 148 (04-06)

- National Acoustic Laboratories (Health), p 98 (13)
- National Biological Standards Laboratories (Health), p 99, (13)
- National Botanic Gardens (Territories), p 176 (12)
- National Building Technology Centre, p 104 (04)
- National Energy Research Development and Demonstration Council (Resources and Energy), p 35, 136 (7)
- National Health and Medical Research Council (Health), p 39, 99 (13)
- National Library of Australia (Arts, Heritage and Environment), p 62 (01 to 18)

- National Materials Handling Bureau (DITAC), p 114 (03-04)
- National Soil Conservation Program (Primary Industry), p 127 (12-15)
- National Standards Commission (Science), p 170, (02 to 08)
- National Water Resources Assessment Program (Resources and Energy), p 136 (10)

- Office of Defence Production (Defence), p 27, 81 (1)
- Office of the Supervising Scientist for the Alligator Rivers Region (Arts, Heritage and Environment), p 39, 63 (07-10-12)
- Overseas Telecommunication Commission (Communication), p 36, 76 (04)

- Patent, Trademark and Design Office (Science), p 148 (02 to 16)
- Pathology Laboratories (Health), p 100 (13)
- Pathology Laboratories (Veteran's Affairs), p 185 (13)
- Primary Industry Fisheries Service (Primary Industry), p 126-127 (11)
- Productivity Council of Australia (DITAC), p 115 (1-6)

- Reserve Bank of Australia (Treasury), p 183 (15-16)

- Snowy Mountains Engineering Corporation (Housing and Construction), p 104 (04-07-10)

- Telecommunication Commission of Australia (Telecom), p 36, 73, (04)
- Ultrasonic Institute (Health), p 99 (13)

NOTE: Figures in parenthesis indicate the major fields of research (disciplines) in which the Agency is involved.

Fields of Research are:
1. Engineering and Technology: Defence Application
2. Engineering and Technology: Resources Applications
3. Engineering and Technology: Technology Intensive Industries
4. Engineering and Technology: Service Application
5. Physics and Mathicmetics
6. Atmospheric and Space Science
7. Energy Disciplines
8. Chemistry
9. Earth Resources
10. Water Resouces and Physical Environment
11. Marine Science
12. Applied Biology and Living Environment
13. Health and Medical Science
14. General Biology
15. Rural Science
16. Business and Information Science
17. Humanities and Social Science

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